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Official Proceedings

Of the Third Annual Session of the
Trans-Missouri Dry Farming Congress
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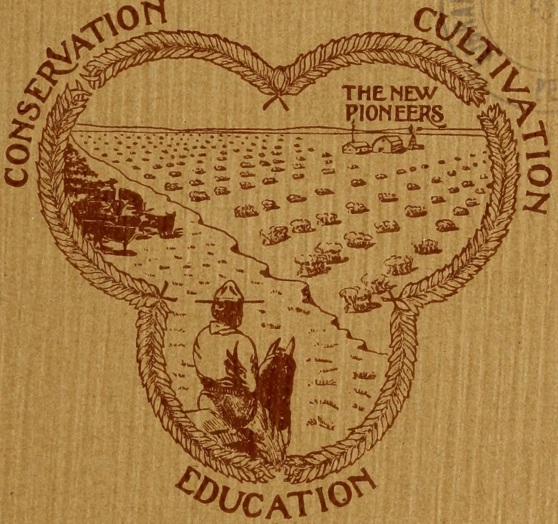

¶ Including the Report of the Congress
Statistician and other valuable Dry Farming
information—Sub-divided for handy reference

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The
Dry Farming Congress

Formerly the Trans-Missouri Dry Farming Congress

HAND-BOOK OF INFORMATION

¶ Being a stenographic report of the proceedings of the Third Annual Sessions of the Congress held in Cheyenne, Wyoming, February 23, 24 and 25, 1909. ¶ Edited and indexed for the Student.

This Book is Furnished Free to Members
of the Congress

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How to Find the Subjects

The stenographic report of the third annual session of the Dry Farming Congress, in the city of Cheyenne, Wyoming, February 23, 24 and 25 last, contains so much that is valuable as permanent material for students of dry land agriculture that it was the desire of the Executive Committee of the Congress that the report should be so arranged and the addresses subdivided by headings, that this book might become a "hand book" of general information for the farmer.

The reader will be able, by referring to the index in the back of the book, to locate with but little delay, any reference to any subject of practical interest by any speaker either upon the floor or platform of the Congress.

For instance: Seed breeding is discussed in many addresses. The student interested in seed breeding will refer to "Seed Breeding" in the index and will there find the numbers of the pages upon which can be found any references to the subject. By turning to the pages indicated he will find the paragraphs containing the desired information identified by the subhead indicated.

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Dry Farming Congress

1909

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Lyman J. Briggs, Department of Agriculture, Washington, D. C.
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Arthur R. Briggs, President California State Board of Trade, San Francisco.
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Secretary-Treasurer—

John T. Burns, 407 Temple Court, Denver, Colorado.

Third Annual Session

THE Stenographic Report of the Third Trans-Missouri Dry Farming Congress given herewith constitutes the "business" report of the convention, but it is due to the Wyoming Board of Control and citizens of Cheyenne that a word be said regarding the social side of the great meeting and the manner in which the arrangements were carried out by the Convention City.

Regardless of the fact that one of the most severe blizzards of the year prevented hundreds of delegates from attending the Congress, the total registration reached five hundred, many delegates arriving on belated trains, having spent several days enroute. For twenty-four hours previous to the opening of the Congress a blinding snow storm raged over the western states, tying up traffic and endangering live stock to such an extent that a large portion of the delegates felt that it was unsafe for them to leave their homes.

This fact failed to lessen the enthusiasm or interest of the half thousand members of the Congress who assembled from the thirty-five states and six foreign nations represented on the floor of the Congress, and when the great meeting had closed this organization had assumed proporions at once national and international and had laid out for itself a work which, if carried to completion, will open up for settelment millions of now unoccupied acres of productive soil in every section of the world.

The Wyoming Board of Control did a mighty work in behalf of the West.

It had planned one of the most complete and practical programs ever given in a convention of this character. It eliminated every subject except that germane to the work of the Congress and in the face of the most discouraging weather conditions which it has been the misfortune of any convention city to experience, its committees entertained the hundreds of guests admirably by meeting the visiting delegations at all trains with free transportation to the place of registration and from thence to their hotels; by furnishing guides to every point in the city, etc.

The Masonic Temple, the Elks Home and the Industrial Club building were all opened for the week and committees of business men were in each place to entertain guests.

The program was not all WORK. It included four hours of fun at Turner Hall, where a vaudeville performance and band concert were but auxiliaries to an excellent "spread" furnished by the Entertainment Committee; a reception and ball at the Elks Home and numerous special entertainment features of a most enjoyable nature. Throughout the Congress music was furnished by the famous Garguilo Concert Band.

Although very late in the year for such an effort, the Board of Control established a new feature of Congress work by giving the First International Dry Farming Exposition and in this was found one of the most valuable features of the convention. Eight states were represented in the competitive displays, and Canada, with a modest exhibit indicated the interest of our neighboring nations. It is to be hoped that this exhibition was but the beginning of what will quickly assume world wide significance.

In its wisdom the Congress decided to drop the words "Trans-Missouri" from the title of the organization allowing a wider scope of work for the future. A number of selections of foreign vice presidents were made from among the international delegations present and from this beginning the Dry Farming Congress must necessarily grow into a great world movement which can not complete its work until the problems confronting the arid farmers of the universe have been settled permanently.

This splendid, philanthropic movement is deserving of the co-operation and support of every seriously minded man in this and every country of the world. It hopes to work hand in hand with every other legitimate development organization in the field in bringing out the best results and in discouraging dishonest exploitation of projects which might result in permanent injury to the upward movement of the splendid empire west of the Missouri river.

FRANK C. BOWMAN,

Chairman of the Board of Governors of the Executive Committee.

The Reclamation of the
Arid Lands of the World

by scientific soil culture, seed breeding, conservation of the limited rainfal and study of the requirements of success in every district of the world, constitutes the most economic problem of the century.

The Dry Farming Congress

is a student body of agriculturists meeting annually to exchange ideas and to carry on a co-operative study of the whole subject.

It publishes semi-monthly bulletins and other pamphlets free to members.

Its only object is to place in the hands of members every scrap of information calculated to assist in overcoming the problems of the "Dry Farmer."

Its Statistical Bureau and International Department are both doing practical work and members are given the advantages of studying not only their own condition but the conditions under which dry land agriculture is being developed throughout the world.

Publications of the Congress may be purchased by anyone interested. Members receive them without other charge than the annual fee of one dollar or the life membership fee of ten dollars.

◆

JOHN T. BURNS, Secretary-Treasurer
407 TEMPLE COURT
Denver, Colo.

AN INVITATION

Montana, the home of The Fourth Annual Dry Farming Congress extends to the members of this Congress and to all students of dry land agriculture, a cordial invitation to attend the Congress and the Second International Dry Farming Exposition, in Billings, Montana, October 26, 27 and 28, 1909.

Montana is a unit in this invitation. It believes in dry farming, so-called, as one of the mighty uplifting forces among the agricultural studies of the world. Montana is the center of one of the great dry farming sections of the northwest. It has millions of acres to be placed under irrigation by projects now under way or proposed, but it has many more millions of acres to be placed under prosperous cultivation by dry farming methods.

Its climate is remarkably healthful in every altitude and splendid homesteads can be located or private lands purchased in almost any altitude desired from 3,000 to 7,000 feet. Montana can furnish homes for a million more families, and, as development has but just begun, the ground floor is open NOW.

Four of the greatest trans-continental railroads with their branch lines forming a network of railways, furnish Montana with transportation facilities seldom found in one commonwealth.

We intend to show the visitors to The Dry Farming Congress what a great state can do in the way of entertainment but we urge every delegate to plan his trip long enough ahead to spare an extra week to investigate Montana as a place of investment and as a home state. Our citizenship, the cream of American men and women, will give you a hearty welcome.

A booklet describing Montana is issued by the state and will be sent to you upon receipt of postal card or letter addressed to the Commissioner of Agriculture and Immigration, Helena, Montana.

ASK THE COMMISSIONER FOR SPECIAL INFORMATION ABOUT SUBJECTS IN WHICH YOU ARE INTERESTED OR REQUEST HIM TO PUT YOU IN TOUCH WITH SECRETARIES OF LOCAL COMMERCIAL BODIES.

Stenographic Report of the Proceedings of the Third Annual Session of

The Dry Farming Congress

(Formerly the Trans-Missouri Dry Farming Congress)

Held at Cheyenne, Wyoming, February 23-25, 1909.

The Congress was called to order in the Capital Avenue Theatre at 11:30 o'clock a. m., on Tuesday, February 23rd, 1909, by F. C. Bowman, Idaho Falls, Idaho, Chairman of the Executive Committee.

Mr. Bowman presiding: "Gentlemen of The Trans-Missouri Dry Farming Congress, it affords me a great deal of pleasure to call you to order this morning for the third session of this Congress. The Trans-Missouri Dry Farming Congress is now the leading economic movement of the world and I wish to impress upon you the necessity of being careful and conservative in your deliberations, for the reason that the entire world, not the United States, but the entire world, is watching the movements of The Trans-Missouri Dry Farming Congress. It stands pre-eminent in all the movements of today."

After an invocation by the Rev. George C. Rafter, D. D., of Cheyenne, the Congress proceeded to its regular order of business as follows:

ADDRESS OF WELCOME.

By Hon. Bryant B. Brooks, Governor of Wyoming and President of the Congress:

"Ladies and Gentlemen—On this auspicious opening of the Third Trans-Missouri Dry Farming Congress, I have the double pleasure of not only welcoming one and all to this Equality State and to this most American part of America, but also of congratulating you upon the truly remarkable success and growth of Scientific Agriculture. Seemingly nature and time have conspired to make this movement one of the most successful achievements in the whole record of the civilizing progress of mankind.

"Our deep appreciation of your presence here will find its truest expression not in words, but in the carrying out of the excellent program prepared for your entertainment and instruction. The good people of this city have spared neither time nor expense in their efforts to make this Convention a success.

"Aside from the many instructive and eloquent addresses, which will be delivered here, there has been collected in another part of the city one of the most attractive and complete exhibits of dry farming products ever displayed, indicating that our people thoroughly appreciate the tremendous possibilities, which will follow the successful reclamation of the arid and semi-arid regions of the world.

"Two years ago, when the first Dry Farming Congress assembled in Denver, I invited the Convention to come up here and see what Wyoming could offer in the way of dry farming and a good time. I told them it would be of mutual advantage to get better acquainted and that we would welcome them in true Western style. I believe under the inspiration of my own generous enthusiasm, I told them to just bring along everybody in Denver. One year ago this state sent a large and enthusiastic delegation to Salt Lake City, where a similar invitation was extended. It is gratifying today to note that both invitations have been accepted. Moreover, Idaho, Montana, Dakota, Nebraska, New Mexico and many other states, hearing that Colorado and Utah were coming to old Cheyenne for a good time, evidently concluded to fall in line and make it unanimous. It is fortunate for all of us that many distinguished representatives from other lands are here to witness just what will happen when a bunch like this gets together.

Originated in Denver.

"Denver originated this Dry Farming Congress, and the first official call was issued by that brilliant and stalwart son of Colorado, Governor Jesse F. McDonald. Denver has started many good things, including the Trans-Mississippi Commercial Congress, the American Mining Congress, the National Live Stock Association, and the National Irrigation Congress, but of them all, The Dry Farmng Congress is one of the best and most important.

Spread of the Movement.

"We call it The Trans-Missouri Congress, and think of it mainly in connection with our own semi-arid states of America, but so important and stupendous is its work, that in two brief years its theories, experiments and teachings have spread to every nation and to every land. Its proceedings have been translated into many languages and its lessons studied by millions of firesides. To the inhabitants of certain sections of Europe, Asia, Africa, Australia, as well as in both North and South America, the possibilities of settlement and improvement under better methods of scientific agriculture as outlined by this Congress have been accepted with enthusiasm and at this Convention, we have not only earnest delegates from our own great sisterhood of states, but also representatives from many foreign countries.

"All are welcome, thrice welcome, and we rejoice that all can unite in this great and glorious work of reclaiming the waste places of the earth.

"Material and social conditions are quite similar in all the Trans-Missouri states. Within this section is embraced a vast territory, wonderfully rich in natural resources of many kinds; precious mineral ores abound in the mountains and hills; large coal measures and numerous oil fields underlie the high plateaus; the granite rocks are hidden by millions of acres of virgin forests; thousands of beautiful streams and mighty rivers, fed by the everlasting snows above timber line, pour forth their life giving waters, which, reaching the lower lands, are harnessed and driven to do man's bidding; the marvelously fertile soil still retains in nature's mighty storehouse those rich soil ingredients so essential to plant production; the air is pure and bracing; many natural wonders beguile the senses, and all this land is blessed with a temperate and healthy climate, inviting outdoor labor. Truly nature has performed her part and the pioneers, who with iron resolution have blazed the way for future peaceful settlement, have brought to this land of promise the choicest blood of humanity, and a spirit of chivalry, optimism, Christianity and patriotism as everlasting as the hills.

"We recall with pride our brief history of conquest, and urge the closest inspection of our present material, intellectual and moral conditions, inviting comparison of this new West with the most favored locality on earth, regardless of the weight of years or the majesty of numbers. By right of experience and achievement, we look upon the future with confidence, and confidence goes a long way toward success. Time seems too short to accomplish all we wish to do, but rest assured we will do the best we can, well knowing that our posterity will look back upon ours as the Golden Age, and envy us, who first burst into this silent, splendid West. Possibly we are in a measure intoxicated by the majestic scale of the surroundings in which our lot is cast, but remember we are the missionaries of civilization, endeavoring to make possible the successful reclamation of the erstwhile deserts.

Increase in Precipitation.

"Pessimists point to Egypt, calling attention to the fact that centuries of irrigation along the Nile produced no material increase in natural rainfall. We call attention to natural laws of evaporation, precipitation, and moisture conservation, believing that humanity has never witnessed such an influence upon nature as will be brought about when one acre out of every six in all this arid region is under irrigation. Even now, dews, which were unknown in this section twenty years ago, are almost a nightly occurrence, and plants flourish largely by absorbing this moisture from the atmosphere.

"Skeptics contend that this dry farming propaganda is a land jobbing scheme, but tens of thousands of successful farmers disprove the charge.

Co-operative Methods.

"Intelligence is the light of the world, and the work of this Congress is purely educational, doubly educational, for it is our mission to educate the people and to educate the plants. At these annual conventions, we receive the inestimable benefit of the combined knowledge of all the state and federal experimenters and practical farmers in the Trans-Missouri states, thereby preventing unnecessary failure and saving tens of thousands of dollars, which would otherwise be expended in duplicating unsuccessful experiments. If new settlers, who can ill afford to make mistakes, will avoid experiments and confine their efforts along the lines of scientific agriculture, which have been clearly demonstrated as successful, we need have no fears of the result.

"Under approved dry farming methods. millions upon millions of acres of public land can and will be settled, and this conquest is easy as compared with the early settlement of New England. There the pioneer faced a rigorous climate and was menaced by merciless savages. There the forests had to be cleared, the underbrush burnt, the stumps and stones hauled away. There the soil was miserly and the pumpkins on the steep hillsides had to be braced to keep them from rolling away; but despite adverse conditions, that New England community, built solidly upon the four corner stones of justice, learning, liberty and law, grew and prospered and became so powerful that later on their ideas gave form to the National Government and wholesome life to many of the great institutions of the West.

"Then followed the conquest of the middle prairie states, but, mind you, present day difficulties are as nothing compared to theirs; for during the last twenty-five years the pulse and pace of the world has marvelously quickened. The prairie schooner has been superseded by the immigrant car; the messenger on horse back has been replaced by the telegraph and telephone; and the ox team has given way to the steam plow.

Seed Selection.

"The dry land farmer of today has all the appliances and contrivances of modern science and invention at his command, and on the cheap lands of the West, with careful seed selection and proper cultivation, he can fearlessly enter into competition with the most favored farmer on earth. As he develops his farm, the prospector and miner will develop the mines, and the nearby coal camp or mining center will afford him the best home market on earth.

"Then we will educate the plants to be drought resisting and, as the people settle up the country and build permanent homes, unheard of methods of reclamation will be adopted. The knocker, who gleefully recalls the early failures in Kansas and Nebraska and prophesies disaster is going to be fooled. The people will not starve out and move away, for there is no place to go to. The free prairie lands to the East of us have disappeared forever, and there 'Ain't nobody makin' no more land.'

"Moreover, with the rapid increase in wealth and population, the chances are that real estate will never be any cheaper.

"My friends, I trust that the proceedings of this Congress may prove harmonious and successful, and that your visit to this state and city may prove so profitable and enjoyable that you will visit us frequently.

"Wyoming with its wealth of undeveloped resources is proud to have you with us, for we appreciate your glorious work."

ADDRESS OF WELCOME.

By Hon. Peter S. Cook, Mayor of Cheyenne.

"Mr. Chairman and Gentlemen of The Third Trans-Missouri Dry Farming Congress, or as I ought to have said, The First Scientific Dry Farming Congress of the World—I bid you welcome.

"There are, I am told, representatives here from many of the important countries of the world, also from every corner of the United States. In the short space of three years this Congress has grown from a few scientific, or dry farmers, who met together in Denver, to what is now one of the most important gatherings of modern times. And Cheyenne, also our whole state, feels proud that this great gathering a year ago had the confidence to elect our esteemed Governor its chief officer, and to select our city to entertain you at this time. I have no doubt but that this meeting will go down in history as one of the greatest gatherings of scientific farmers the world has ever known.

"I extend to you the welcome of our citizens and city which, most of you, no doubt, know as the 'Magic City of the Plains,' a name given to Cheyenne in early days. In those days the land where Cheyenne now stands was a part of what was then known as the 'Great American Desert,' where it was supposed nothing could live but the Red Man and wild animals. The name was no doubt very appropriate at that time, but with the zeal and pluck of true western spirit our people have worked and toiled until they have transformed what was once this great desert into a paradise, and you can now see the roses bloom where once the cactus and sage-brush grew. You can look north, south, east and west and all around our city, at proper seasons, and see the yellow tops of grain and green fields of alfalfa produced by the skill of such men as have met here today, to take part in the deliberations of this great assembly. This great transformation has taken place on soil where it was supposed nothing could be grown except, as was said before, cactus and sage-brush, but by the work and toil of such men as are in attendance at this Congress, these prairies are today the garden spots of the West.

"To you, our guests, I have the honor to say that you will find a latch-string hanging out from every door in Cheyenne, which we expect you to pull and step right in and make yourselves at home. By our carelessness the keys of the city on this occasion have been lost, so that it is impossible for me to present them to you—but the city is yours. Each citizen has been delegated a committee of one to entertain you, so do not be afraid to ask for what you do not see—we will try and find it for you—in fact, Cheyenne is yours and we sincerely hope that upon your return to your different homes, it will be with the most pleasant recollections of your stay among us. We sincerely hope it may leave a lasting impression with you, so that when you are talking of us, you may be able to say, 'The citizens of Cheyenne and Wyoming are the greatest people on earth.'

"Again, gentlemen, I extend to you, from the people of Cheyenne, thrice a hearty welcome and hope that nothing may mar your visit to this, our beautiful city and state."

ADDRESS OF WELCOME.

By Thomas Heaney, President of The Industrial Club of Cheyenne.

"Mr. Chairman, Honored Governor, Ladies and Gentlemen of the Third Trans-Missouri Dry Farming Congress—It might be more fittingly termed International, as I see here today representatives from every quarter of the globe who are here at their own expense to give their time and intellect to a subject of infinite value to the human race, for does it not follow that when the art of conservation of moisture is well understood, the science of dry farming at once becomes practicable and profitable, too?

"The history of this movement is well known to those present here today. It is well admitted that the art of dry farming was, at its inception, never intended to apply further than to a few favored acres in the intermountain states, but what do we behold today? The idea conceived by Mr. Campbell is demonstrated by our own Dr. Cooke, under the supervision of our own Governor, in the vicinity of Cheyenne and at other places in Wyoming. Our Governor had to be "shown" before he became a convert

International Movement.

"Dry farming has interested peoples and nations, aye, to the furthermost ends of the earth, with the result that today the representatives are at this shrine doing homage to the masters in the science, and to enter into deliberations that will bring forth more light on what, to my mind, is the most important material question before mankind today.

"When you gentlemen will have finished your deliberations and adjourned this Congress, you will return to your homes convinced and ready to aver the facts and send forth the message, that on this round earth of ours there are billions of acres heretofore considered almost worthless that are susceptible of cultivation; that will go to make homes for countless millions of the human race yet unborn; who will in the days to come, refer to your work as the most momentous and altruistic ever undertaken, and to yourselves as the apostles of the Material Science that has opened the greatest field for the elevation of mankind. Our Brazilian and Spanish American delegates have a great field; for their possibilities begin in Patagonia and reach clear to our own southern border. The Canadian has everything north of the 49th parallel.

"You, sir, from Australia, may feel certain that you may shortly be reclaiming the vast acreage of the interior of your continent. Your task is made doubly easy by an ambitious, hardy, intelligent populace; and easier still by having a Wyoming man, Professor Elwood Mead, to lead and teach them the art of irrigation, which is another great factor in development. You, sir, representing the Crescent, will have the distinction of reclaiming the seats of ancient civilizations on both sides of the Mediterranean Sea; and more, you have it if you can reach them, to make our Mohammmedan fellow mortals cease their religious wars and quarrels, and direct their energies toward warring on the soil and conquering it to a good purpose.

"Of all the regions that require a cause to give quarrel in which the different races comprising the population have a purpose in common, it is South Africa. When the Englishman, Scotchman, Irishman and Boer see fit to formulate a plan to subdue their plains and vast stretches of unbroken land, and by this great science, convert the hitherto desert into a garden; it will be a much better way to spend energies than they found in the practice of war and devastation. To you of Russia; you will return home with the possibilities of what may be done by this science to make lands of your territories productive. You can look along your steppes and across the plains of Turkestan; through Barkara and Khiva even to the foot hills of the mountains of Afghanistan. You can see away East past the confines of Persia to the north of China and all through Siberia, millions of acres that will surrender the wealth of produce through knowledge of this art that this invention aims to properly classify.

"And now a word from Cheyenne. Grant, Sherman and Sheridan. that grand trio of military geniuses, when they established Fort Russell forty-three years ago, gave proof of the value of Cheyenne's advantage as a wholesaling and distributing station. Until the final settling of the Indian question, Fort Russell—Camp Carlin—was the great entrepot upon which all the armies in the field depended for their supplies of food, clothing, transportation, equipage and munitions, of every sort, as well as re-inforcements of men to fill the oft depleted ranks. Today, the military powers that be, hold this point as the greatest inland military strategic point in the United States, and near by, at Crow Creek Reserve, is the largest practical military school of the nation, where thousands of soldiers, militia and regular, assemble annually for military maneuvers.

"Cheyenne, to which we bid you welcome, is the best city on earth today. It is located near the top of the continent and is the exact geographical center of the United States. It is on the main lines of two transcontinental railways, one running east and west, the other north and south No inland city possesses better transportation facilities. It has a magnificent water system in course of construction at a cost of one and a quarter million dollars, and the sewerage system scheme which, when completed, will reduce contagious diseases to a minimum.

"As it stands, Cheyenne has the lowest death rate of any city in Wyoming, and probably be it said, Wyoming has the lowest death rate of any state in the United States, thus making Cheyenne the most healthful city in the world; for all will concede that the United States leads the world in the application of the science of sanitation which places her at the head of the list for healthfulness. To all those natural and artificial advantages we direct your attention to ask you to enjoy them whilst in our midst; and should we prevail on you to cast your lot with us, we can assure you of three hundred and twenty acres of land of your own selection.

"To this our city we give you a hearty welcome, not only to the homes, but to the hearts and affections of the most hospitable people on God's green earth—in God's best earthly city. Again we bid you welcome. Thrice welcome."

RESPONSE FROM CANADA.

By Mr. D. W. Warner of the Department of Agriculture, Alberta, Canada.

"Gentlemen of the Trans-Missouri Dry Farming Congress, I assure you I am very glad to be with you today. I am doubly glad to be with you. I am glad to be with you as a delegate to this important meeting of such an important organization. I am also glad to be with you as a member or ex-member of your great country, or ex-citizen of your great country. I tell you, gentlemen, it may sound a little hard for me to say an ex-citizen; I am proud of those stars and stripes, as proud as I ever was, and I am also proud of my native country, but I have learned that there is another that is worthy of my love and my loyalty, and I am glad that there is room in my heart for both, and I thank you heartily for the welcome you have extended to the Canadian delegates. I thank the mayor and the president of the Industrial Club of Cheyenne also for this welcome.

"We feel that we have no special message for you. We are here rather to learn than to talk. We feel an interest in what you are doing; we want to know what you are doing, and we want to know how. We have a new country to develop and similar to your own that you are developing under the dry farming system. We will probably watch the proceedings as closely as you people here in the United States.

"When I went to Canada ten years ago to look up a location, Alberta was principally a range country, comparatively speaking, but now we are rapidly turning that into rich farms and a winter wheat growing country. We are reaping greater returns from the land and we expect to feed millions of people in this country where the cattle business fed hundreds. Now, we are so new that we hardly have had experiments enough so that we can give you much of an idea of what we are doing.

Personal Field Work.

"The Alberta government is sending out men who are acquainted more or less with dry farming operations and who are talking to the people along those lines and along other lines of mixed farming. And we find the people very glad to take hold of the work and glad to receive any information we can give them, and we hope by the time we have been with you people through this Congress that we shall have a great deal of valuable information to take back to them.

Rainfall Average.

"We are operating under a rainfall of something near nineteen inches as an average for the province. In some places it is more and in some places it is less than that, but we find that in all parts of the Province the dry farming system is useful and in some places necessary in order to raise good crops.

Crop Rotation—Summer Fallow.

"In some places we can raise crops every year by rotating the crops rightly, in other places we find that we can raise one crop in two years by the right system of farming, and, in still other places, we think it advisable for the farmer to raise one crop in two years by summer fallow and there we use that altogether for cropping. We are learning along these lines.

Results From Methodical Work.

"We have gotten far enough to see the advantages of dry farming and to know how to make use of it. We feel that dry farming is good farming, and in places where we have plenty of moisture we can increase our crops very much by using it. We feel that when there is a time when we have more moisture than we need, the dry farming system is the best way to farm even then.

"We have a soil similar to yours, and that is the reason we are so interested in your work here and the experiments that you people are carrying on. We have experiment stations that are doing some work, but they have been only two or three years at the work and we cannot rely so much upon them, as upon the work that has been done for a number of years in the United States, so, by being located so similarly to you people, we expect to follow and to pattern, as near as possible, after your systems until such time as we can improve upon them, if that time ever comes. Now, I thank you again for the hearty welcome you have extended the Canadian delegates, and I thank you for the kind attention that you have given me."

RESPONSE FROM SOUTH DAKOTA.

Samuel H. Lea, State Engineer, Pierre, South Dakota, responded to the address of welcome as follows:

"Mr. President, ladies and gentlemen:

"South Dakoto is a progressive state and its citizens are ever ready to investigate the merits of improved methods and to keep up with the march of progress, especially along agricultural lines. It is only in recent years, however, that especial attention has been paid to the merits of dry farming in that state, and the period marking the advance of agriculture therein is only a few years longer. In the old days, when an unusually dry season would be experienced, the farmers would become discouraged and many of them would sell out and move to other localities, claiming that crops could never be raised under such conditions. This was true especially of the eastern part of the state, for the western part, with the exception of the region adjacent to the Black Hills, has been largely given over to stock grazing and Indian reservations. Many farms in South Dakota that were abandoned by the original settlers are now highly productive and under modern methods of cultivation, are producing splendid crops.

Have Climatic Conditions Changed?

"There have been many theories advanced to account for this changed state of affairs, the most popular theory being that the climate has changed and that the rainfall has increased. It is unnecessary to tell you that such a theory is without foundation. This matter has been discussed over and over again and climatic conditions affecting rainfall have been explained with great clearness by the U. S. Department of Agriculture. Our climate has not changed in general character, and there is no probability that it will ever do so. It is true that there have been some years of unusually heavy rainfall, also some years of unusually light rainfall, but there has been no permanent change.

Results From Methodical Work.

"The true reason for the advancement of agriculture in South Dakota, aside from the fertility of the soil, is found in the intelligent application of improved methods of farming. It is true that in recent years there has been a preceptible increase in rainfall in some districts where splendid crops have been grown. On the other hand, some districts have had exceptionally light rainfall and good crops have been grown therein.

Seed Selection.

"The practice of scientific soil culture and the careful selection of seeds have afforded splendid results in eastern South Dakota, and the prosperous condition of the state may be largely attributed to these causes, for South Dakota, although rich in mineral resources and possessing the largest gold mine in the world, is essentially an agricultural state.

Campbell System Advocated.

"The methods of scientific soil culture, now so largely employed, are based practically on the Campbell system, now universally recognized as being peculiarly adapted for farming under conditions that prevail in our western country. These methods involve the well known principles that are advocated by Prof. Campbell and practiced by successful farmers throughout the semi-arid states.

"In the extreme western part of south Dakota irrigation is largely practiced, especially in the territory adjacent to the Black Hills. In that region flowing streams, fed by mountain snows, are numerous and conditions are favorable for great development in irrigation work. The general government has recognized this fact and has undertaken the great Belle Fourche Irrigation Project for reclaiming a large tract of irrigable land, and has under consideration the Grand River project. Other irrigation projects, mostly under private ownership, are in operation and still others are under construction in western South Dakota and the prospects are good for a large increase in the area of irrigated lands in the state. The large Indian reservations in the west central part of the state will soon be opened to settlement and there will be many fine openings therein for irrigation projects, especially those constructed under the provisions of the Carey Act.

Transformed the Range.

"It is in the newly settled part of the state, however, that the greatest progress in dry farming has taken place. In Stanley and Lyman counties, lying just west of the Missouri River, many thousands of settlers have taken homesteads within the last few years. There are thriving towns and villages now where formerly range cattle roamed at will, and flourishing crops grow on the prairies that were carpeted with native grasses before the advent of the settler.

"This section of the state has comparatively few running streams and the rainfall is somewhat less than in the country east of the Missouri river. For many years after the sections to the east and to the west were settled this territory was given over to the undisputed sway of the cattlemen, who enjoyed the privileges of free grazing for their herds that fed upon the succulent grasses covering the vast prairies.

Education Necessary.

"A new order of things has come to pass, however, and thousands of homes have been made on these lands and excellent crops are raised where once was thought no vegetation other than the native grasses would grow. Many of the settlers have evidently started in with the idea of meeting existing conditions in a rational manner. Thanks to the wide spread dissemination of information concerning the principles of dry farming and improved methods of soil culture, they came prepared to put in practice these methods as far as practicable. The results have been gratifying in the extreme. A trip of inspection through this region disclosed remarkable crops of corn, vegetables and other products growing upon sod breakings. Reports have been made of yields that are truly astonishing when existing conditions are taken into account. The season just passed has been unusually dry and for that reason opportunity has been afforded for a severe test of the merits of dry farming in the area under consideration.

Results From Methodical Work.

"In some cases crops of corn were observed where the stalks were withered and drooping, while in a neighboring field the vegetation was seen to be flourishing and vigorous. Inquiry would reveal the fact that the good crops were the result of dry farming, while the poor crops were grown by men who did not believe in new fangled ideas.

Experimental Stations.

"In the vicinity of Rapid City, in Pennington County, much interest is taken in dry farming methods. The enterprising business men of that city have taken steps to establish an experimental farm and are proceeding to encourage the practice of scientific soil culture on the bench lands and the lands lying beyond the reach of irrigation in the adjacent region. They are enthusiastic over the matter and will undoubtedly succeed in doing much good.

"The following extract from a letter written in reply to an inquiry from my office about results in dry farming in Pennington County during the last season may be of interest:

Soil Treatment for Alfalfa.

" 'Now, in regard to my field of alfalfa at Bend, it was sowed six years last spring; I first plowed it with a "disc plow," harrowed it at noon and supper time each day it was being plowed; and after the plowing was done, I ran over it again with a harrow, making the field as soft and fine as a flower bed. I then sowed 19 pounds of clean seed to the acre, no nurse crop at all. The young alfalfa was clipped once in August, and the hay left on the ground as a mulch and to protect the roots of the young, tender plants from the rays of the sun.

"The next year, such a crop it was, I cut it only once, but that one crop was a bouncer, all who saw it were amazed. Thick as a lawn and 26 or 28 inches high. The second year was better. I received two large crops the third year and two crops each year thereafter; I could have cut a third crop last year, but I needed pasture and turned in some stock.

" 'I was and am yet favorably impressed with alfalfa on dry land.

" 'A second letter reads as follows:

" 'Location of farm, four miles west of Viewfield on the table land north of Elk Creek. I have thirty-five acres which I fall plowed.

Seeding Amount to the Acre.

" 'In the spring I disked in one bushel of oats to the acre as a nurse crop. I sowed ten pounds of alfalfa seed to the acre, then harrowed good. When the oats were ready to cut the alfalfa was so tall that I cut the alfalfa too. After the second year, I have either disked or harrowed it every spring. I had a fine stand of alfalfa.

Alfalfa—Two Crops Annually.

"I have had two crops each season. It averages two tons to the acre a year, besides the fall pasturing. I should judge it is about twenty feet down to water. The land is level with a black loam soil. It is free from sand or gravel. I have been cutting it for eight years and have a good stand yet.

"In the older settled part of the state, lying east of the Missouri River agricultural conditions are prosperous, and the farmers are generally disposed to let well enough alone and to go on in the same old way. In this section there has been for a number of years a favorable seasonal distribution of the rainfall and this in connection with the excellent quality of the soil, has resulted in excellent crops.. Even in this favored section the superiority of improved methods of farming can be seen in striking contrast when compared with old methods.

Live Stock on the Dry Farm.

"A typical instance is that of Mr. G. H. Carroll of Hand County. He has a farm of twentyfive hundred acres on which he keeps from three to five hundred head of cattle and about two hundred horses. He cultivates 700 acres, of which 160 acres are in corn and the balance in small grain. Mr. Carroll came to Hand County with less than $1,000 capital, but with plenty of brains, muscle, energy and determination. In addition, he is an advocate of scientific soil culture and a believer in dry farming.

Irrigation and Dry Farming.

"I do not desire to go on record as an advocate of dry farming to the exclusion of irrigation where the same is practicable. As State Engineer of South Dakota my practical work is in connection with the use and application of water for irrigation and other beneficial uses. Whereever practicable to do so it is advantageous to irrigate land and by such means get the best possible results from the soil. There is, however, a limit to the irrigable areas, even when every acre of irrigable land is taken into account. Fortunately, in South Dakota we have not reached this limit and there yet remains a vast amount of land subject to irrigation. This land can still be obtained cheaply and there is room for thousands of settlers who wish to take up irrigated farms, and I presume this is the case in other states of our great West. This condition is shown by the immense irrigation projects undertaken by the Reclamation Service, also by those constructed under the provisions of the Carey Act

"But after every acre of available land is under irrigation there will remain a vast area that will necessarily have to be cultivated without irrigation, or with, at the best only partial irrigation. Multitudes of people in the course of time will inhabit these lands and grow crops thereon.

Work of The Congress.

"It is largely for the benfit of these uncounted thousands, no less than for those now occupying homes on the land, that the Trans-Missouri Dry Farming Congress is now striving. The labors of The Congress have already resulted in immense benefits to the people of the west and the accruing benefits will be of instimable value in the future. Not only our own country, but many foreign nations will benefit from our labors, for there are other countries where the same conditions exist, and the same problems remain to be solved. I hope to see in the not distant future an expansion of our present scope to embrace a World's Arid Farming Congress where the nations of the world will be represented."

RESPONSE FROM BRAZIL.

By Dr. Lawrence Baeta-Neves, Delegate From Brazil.

"Your Excellency, the Governor of Wyoming, and President of the Congress:

"Mr. Chairman, Honorable Members of the Third Trans-Missouri Dry Farming Congress, Ladies and Gentlemen:

"Honored by a special invitation sent to me through the kindness of Mr. John T. Burns, secretary of The Congress, to take part in these sessions, that we are now attending with so great interest, I immediately decided to accept the invitation. I could not have any idea of declining the courtesy extended to me by that gentleman, and I desired to learn from your experience what interests me and constitutes one of the subjects of my scientific investigation in this admirable country.

"The great deal of which I learned in the last Irrigation Congress in Albuquerque, that I attended in the capacity of delegate of the Brazilian government, influenced me not to wish to lose this important meeting of the Dry Farming Congress, so full of interest and utility for the peoples who wish for the prosperity of their countries.

"In the Irrigation Congress I had practically an additional proof of the advantages coming from the co-operation of different ideas for the solution of one certain problem. Giving consideration to the experiences of many men in different ways, under different conditions of time and place is undoubtedly the best and surest factor of success in any work, principally when we consider something like dry farming, that demands above all, serious study and very much observation.

International Movement.

"Really, the dry farming problem is of this class and the great interest that it awakens all over the world is only a consequence of the combination of ideas and efforts of those pioneers of the work in the conquest of the land from the desert. And you North Americans, better than anyone else, know very well how to profit by this truth, and you, without having any egotistical feelings, without any intention of demonstrating superiority above other countries in the line of your works, open your doors to the foreigner who comes to study your progress. With an altruism and courtesy that I appreciate very much, you show him the results of your patient experiments and all the necessary explanation to them.

"With my best wishes for the most successful results of this Third Trans-Missouri Dry Farming Congress, I heartily thank you for your courteous welcome."

ORGANIZATION.

Mr. Bowman (presiding): "I am requested to announce that all the delegations must organize during the day and select one member of the resolution committee and one member of the committee on nominations and report the same to the secretary before the opening of the night session. These committees will be named by the chair tonight, and the election of officers will occur tomorrow morning. All delegates who have not done so will please go to the Commercial Club and register and get their badges. The Executive Committee will meet at 1:45 p. m., at room 8 in the Annex building.

"The secretary has some letters and telegrams from those who were unable to be here, which he will now read:"

The secretary, Mr. John T. Burns, then read a number of telegrams, as follows:

"Washington, D. C., Feb. 23, 1909.

"Hon. Bryant B. Brooks, President Trans-Missouri Dry Farming Congress:

Federal Co-operation.

"I wish to extend to you greetings and congratulations upon your third annual meeting. I am deeply interested in the progress of your work. Any organization having for its purpose the development of the agricultural resources of the great semi-arid sections of the United States should have the hearty support of all good citizens. I am in full sympathy with your efforts and appreciate hardships, privations, and difficulties with which the pioneers among the mountains and on the great plains have to contend. Rest assured that so far as lies within my power, everything that can be done to aid you will be done. The reclamation of our lands through irrigation, the conservation of our forests and other natural resources, and the development of our semi-arid lands by such methods as you are now advocating, all tend to insure the growth and well being of this country. I trust that your meeting will be a great success and will result in action that will command the confidence and support of the home-builder, the man for whom we are all working.

Sincerely yours.

(Signed) "Theodore Roosevelt."

"Salem, Ore., Feb. 23, 1909.

John T. Burns, Secretary, Cheyenne, Wyo.:

"Oregon is deeply interested in the purpose of this Congress. There is much of the arid territory susceptible of cultivation if processes applicable to semi-arid regions can be properly applied. I hope the efforts of this Congress will result in much good to the whole country.

"GEO. A. CHAMBERLAIN, Governor."

"To His Excellency, Bryant B. Brooks, Governor of Wyoming; President of the Third Trans-Missouri Dry Farming Congress, Cheyenne, Wyo.:

"I have the honor to acknowledge the receipt of your kind invitation to be a representative of the British government to participate in The Congress in your city. As there is now no time to send your invitation to London, I am forwarding the same, unofficially, to the Minister of Agriculture at Canada, who is, I know, very much interested in this question. There is yet time for persons to come to The Congress from Canada if the counties interested desire to be represented, and the course I am taking will, I hope, enable that to be done.

"I take this opportunity of expressing my personal interest in the subject, which is very great. There has been hardly any development in modern science more remarkable and of greater promise than this of the Dry Farming system, and I hope your Congress may do much to further it.

(Signed) JAMES BRYCE, Minister of England.

"British Embassy, Washington, D. C., Feb. 3, 1909.

"February 23, 1909.

"Governor B. B. Brooks, Cheyenne, Wyoming:

"National Congress is not doing more for development and improvement of once considered waste places of country than its prototype in Cheyenne, the Trans-Missouri Dry Farming Congress. Wyoming was first state to adopt comprehensive system irrigation laws and influence of state was potent in securing present national irrigation act. Next step in development of western country, I believe, will be intelligent adoption of dry farming methods, and this will bring great areas of land under cultivation now looked upon as worthless. Dry Farming Con gress at Cheyenne will be material factor in this work and it has my heartiest wishes for successful session:.

"F. E. WARREN."

"Helena, Mont., Feb. 22, 1909.

"W. B. George, Dry Farming Congress:

"Please extend to Congress invitation to hold next meeting at Billings, assure delegates of royal welcome and enthusiastic meeting.

"EDWIN L. NORRIS, Governor of Montana."

"Helena, Mont., Feb. 22, 1909.

"Governor Bryant P. Brooks, President Dry Farming Congress, Cheyenne:

"Regret my inability to attend Congress, session of legislature prevents. Our people greatly interested in dry farming and will gladly cooperate to further movement. Legislature will make liberal appropriations for experiments.

"EDWIN L. NORRIS, Governor of Montana."

The convention adjourned until 2.15 p. m.

Second Session, Tuesday Afternoon

The Congress was called to order at 2.15 o'clock by Chairman Bowman of the Executive Committee. Mr. Bowman (presiding): "I now take pleasure in introducing to you your chairman for this session, the Hon. James H. McColl, member of Parliament of Australia, who has come twelve thousand miles to attend this Congress."

Hon. James H. McColl (presiding): "I thank you for the honor that has been bestowed upon me this afternoon, and I will simply call attention to the few rules from this pamphlet which I hold and ask that they be strictly complied with.

TELEGRAMS.

The secretary read the following telegrams:

"Pierre, S. D., Feb. 23, 1909.

"John T. Burns, Secretary, Cheyenne:

"On behalf of the citizens of South Dakota I extend greetings to the officers, members and delegates assembled in the Third Trans-Missouri Dry Farming Congress.

"R. S. VESSEY, Governor South Dakota."

"Billings, Mont., Feb. 23, 1909.

"The Trans-Missouri Dry Farming Congress, Cheyenne:

"The Yellowstone County Bar Association extends you a most cordial invitation to hold your fourth annual session at Billings in 1909.

"JAS. R. GOSI, President;
"HARRY L. WILSON, Secretary."

"Spokane, Wash., Feb. 23, 1909.

"Hon. B. B. Brooks, President Trans-Missouri Dry Farming Congress, Cheyenne, Wyo.:

"We understand the Dry Farminng Congress treats of the conservation of moisture in the soil. In this respect and in the fact that both are working for the better utilization and conservation of our nation's natural resources, we believe there should be as much co-operation as is possible between the Trans-Missouri Dry Farming Congress and the National Irrigation Congress. We wish for you the greatest success and regret exceedingly that we are unable to be represented at your meeting by members of our Board of Control. We extend to you, and would be pleased to have you extend for us to the delegates and visitors at the Dry Farming Congress a cordial invitation to attend the Seventeen National Irrigation Congress at Spokane, August 9-14, 1909.

"R. INSINGER, Chairman Board of Control."

EXECUTIVE COMMITTEE REPORT.

Mr. F. C. Bowman, Chairman of the Executive Committee, made the following report of the work of that committee:

"To the officers and delegates of the Trans-Missouri Dry Farming Congress—Gentlemen:

Election of Officers.

"Your Executive Committee, elected by the last Congress on the afternoon of January 23, 1908, affected a temporary organization, by electing Mr. F. C. Bowman, of Idaho Falls, Idaho, Temporary Chairman, and Mr. S. H. Lea of Pierre, South Dakota, Temporary Secretary. The next question was the one of selecting an Executive Secretary for the Third Congress. On motion, Mr. Fisher Harris of Salt Lake City, Utah, was made Executive Secretary.

Financing the Congress.

"The question of finance was then taken up and Mr. Douglass White of California, made the committee the proposition to publish an illustrated book on Dry Farming; Mr. White to assume all the responsibility and to turn over fifty per cent. of the net profits to the Congress. Mr. White's proposition was accepted. As the proposition of Mr. White did not give immediate funds, the following motion was adopted:

Membership Fee Fixed.

" 'That an annual fee of One Dollar be charged for affiliated membership in the Trans-Missouri Dry Farming Congress, and that a life membership fee of Ten Dollars be charged, and that for such fee all literature issued by the Congress, including the proceedings of the present Congress be forwarded to each member and that each membership so issued would entitle the member to the same privileges as an appointed delegate.'

"On motion, the chairman was empowered to appoint a Traffic committee to consist of two members of this committee and the Secretary of the Third Congress—said committee to transact all necessary negotiations, regarding transportation and traffic, of the Third Trans-Missouri Dry Faring Congress.

"The Chair appointed the following traffic committee: Messrs. Douglas White of California, H. B. Henderson of Wyoming, and Fisher

Harris of Utah. On January 24, 1908, the Executive Committee authorized the secretary to employ an assistant who should, under the direction of said secertary, create a bureau of Statistical Information on Dry Farming, and to perform such other duties as might be assigned to him.

Requirements for Local Convention.

"Regarding the place of meeting, the following resolution was adopted:

" 'Be it resolved: That it is the sense of this Committee that any city and state desiring the third annual convention of the Trans-Missouri Dry Farming Congress, shall be expected to present to this committee, through its proper accredited delegates, an acceptable guarantee of entertainment and expense fund, and the publication of the report of the Third Congress, and shall guarantee that its hotel accommodations shall be ample and that it will provide an assembly hall of sufficient size to accommodate the delegates, their friends, and the public who will attend the Congress meetings.'

"Under the above resolution, Douglas, Arizona, Cheyenne, Wyoming and Los Angeles, Cal., bid for the Third Congress; the vote standing: Cheyenne 9, Los Angeles 1, Douglas 3. Wyoming was selected as the choice of the Executive Committee, for the place of holding the Third Congress.

"On January 25th Governor Cutler of Utah was elected treasurer of the Third Congress and F. C. Bowman, of Idaho Falls, Idaho, was elected as permanent chairman of the Executive Committee.

Board of Control Authorized.

"On February 24th Mr. Fisher Harris, secretary, advised that he had selected Mr. John T. Burns, to act as assistant secretary and his selection was confirmed by the Executive Committee. On August 10, 1908, it appearing that the ways and means devised for financing the Third Congress by the Executive Committee would be inadequate, owing to the fact that the printer who contracted for the publishing of the proceedings of the Second Congress delayed the issuing of the same until it was too late for Mr. White to publish his book, it was decided to authorize President Brooks to appoint a local Board of Control with headquarters at Cheyenne, Wyo., to take charge of the finances, not only of the coming Congress as they had agreed to do, but to raise funds in such manner as said Board of Control deemed it most expedient, to pay the expenses incurred and to be incurred by the Congress from the last meeting in Salt Lake City, to the present meeting.

Headquarters Transferred.

"The committee met informally at the Alvarado Hotel, Albuquerque, New Mexico, while attending the Irrigation Congress, Vice President Govenor Curry, presiding, and it was decided to instruct the chairman and assistant secretary to transfer the records and headquarters to Cheyenne, Wyoming.

"This was done.

"We are pleased to advise that this proposition from the Executive Committee to the people of Wyoming was accepted and the splendid success of the present Congress is due to the intelligent and unselfish work of the Board of Control ably assisted by our Assistant Secretary, Mr. John T. Burns.

"In conclusion your committee desires to congratulate itself and the Dry Farming movement on the exceedingly successful selection for its Assistant Secretary, Mr. John T. Burns.

"Respectfully submitted,

"F. C. BOWMAN, Chairman."

Report Adopted.

Mr. McColl (presiding): "You have heard the report. Does any one desire to make any suggestions or remarks concerning it? If not, will some one make a motion that the report be received, in order that it may be opened for publication."

It was regularly moved and seconded that the report be received and adopted.

Mr. McColl (presiding): "We will now go on with the business of this afternoon. I would like to call the attention of the delegates that our time is limited. We are late in starting this afternoon and I will ask you, therefore, to be as brief as possible in your remarks consistent with the importance of the message.

Roll Call of States.

COLORADO.

Mr. C. C. Williams, Yuma, Colo., responding for the state, said:

"I feel that it is somewhat of a responsibility placed upon me this afternoon in addressing the Dry Farming Congress in behalf of Colorado, a state which only a few years ago was regarded as the heart of the Great American Desert, and which today is still regarded as the heart, not of the desert, but of the Dry Farming movement; a state which has more than 23,000,000 acres of land lying above ditch and east of the Rockies, and of that 23,000,000 acres I think I am conservative in saying that not less than 10,000,000 is susceptible to cultivation under the dry farming movement. Of that 10,000,000 acres less than 2,000,000 acres are today under cultivation.

Dry Farming Acreage.

"Colorado has been regarded as the heart of the dry farming movement, and has received more advertising along that line than any other two states that come within the scope of the movement. That advertising has done much good; it has also done harm, considerable harm.

Fake Advertising.

"Irresponsible real estate agents have gone east and told of the wonderful glories of western lands and have said, by intimation, if not by direct statement, that all the farmer had to do was to turn the furrow and pick up gold dollars following the plow. That has brought to to state many men without sufficient funds and without sufficient brains to carry them through, and many men with energy, ability and stability, but in some instances these same men have been forced to go back to Kansas, Illinois and Missouri in wagons drawn by two lean mules.

"This has hurt the state to a considerable extent, but the state as a whole, and I mean the dry farming portion of the state, is prosperous beyond the belief of those who were interested in the movement a few years ago. Some newspaper reports within the last six months have detailed scenes of destitution and almost starvation in eastern Colorado, the result of the bad year of 1908. Newspaper stories of all kinds have been circulated and have hurt the state, and some of the delegates from other states have been wondering whether Colorado had any crops in 1908 or not.

Causes of Failure.

"A few men have been starved out, but they were of the class described a few minutes ago; men without money, men without equipment, men without homes, men without credit; they have been forced to return to the east because they couldn't scrape together enough money for seed for 1909.

"I can only say, gentlemen, that Colorado today has as great a future, if not greater than that of any other dry farming state in the west. It is further developed than any other state. Development is slow along these lines always. The average farmer does not like to be taught, he wishes to learn. I mean by that, he does not like to have information forced down his throat. He wishes to assimilate and the process of assimiliation is always slow.

"The dry farming movement has gone ahead within the last two years with such speed, such energy, such force and such vigor that some of our Colorado farmers who are dry farmers talk too much and do too little, but I find from circulating among the farmers that, in spite of the fact that many have a definite opposition to the words 'Dry Farming' still we have men who are developing under the Campbell system and other systems which attempt to change the methods as they have been known for years, unconsciously assimilating these methods and putting them in practice on their own farms, to their own salvation.

"Colorado is prosperous in the dry land section, taking the state as a whole. In the town of Yuma, Colo., we have about fourteen new residences, a new furniture store, a new hardware store, a new gent's furnishing establishment and two banks within the last three months in a town of three hundred people, and the bank which has been there ten years has today deposits of $145,000 on a capital of $12,000. Our farmers in eastern Colorado have money. I can point you to hundreds who came in the early eighties and late nineties, who starved through the years of 1893, 1894 and 1895, who today are worth twenty, thirty, forty and even fifty thousand dollars.

Seed Selection.

"We are learning things down there, we are learning how to do things. We are not growing fast, but we are growing. We have learned that we must use good seeds, that we must use acclimated seeds, seeds capable of growth under local conditions. We have learned that we must practice rotation of crops; we are cultivating our soil mulch. We have learned that we must handle the land, not according to set, iron-clad rules applicable to every area, but according to a set of basic principles which must be applied individually to every locality.

Keeping Farm Records.

"The average farmer takes no account of his time, nor the time of his sons. He takes no account of the food for his family or of the hire for teams, or of the feed for the teams, and you ask him at the end of the year what he made and he tells you eight hundred, ten hundred, twelve hundred, two thousand or three thousand dollars, but when you come to find out, you find that is his gross income, not his net profit. We wanted to know whether or not dry farming was a commercial proposition; whether it could be handled by men of business in a business way.

"My records on the farm include a labor record of every man working on the place. It shows every day and it shows the amount received per day; the hours he works; the amount and kind of work which he does, and those records are classified by months, fields and crops. Those monthly records are later classified by years, showing the total amount expended on any field, any crop and any acre of crop. Taking that as a basis, we divide the total cost for labor, the food for the men, the cost of plowing, which is done by steam mostly, the cost for teams, the feed for the teams, the general expenses for maintenance and repairs, and everything which possibly enters into the organization of a farm the size of ours, and I charge that against the individual crops pro rata to the amount of labor involved in the production of that crop.

"I want to give you just a few illustrations gleaned in a very few minutes today noon from the records on file in the office of the secretary of this Congress:

Results from Methodical Work.

"Here is a man from Galatea, Colorado, altitude 4,000 feet, who writes: 'The year 1908 was almost a crop failure because of limited rainfall in the growing season and a dry winter and spring preceding. In spite of this I had a dry farm exhibit at the Lamar, Colorado, fair, which included five counties, that took first premiums on display and nine other premiums when shown against irrigated products.'

Acreage Results.

"At Vernon, Colorado, altitude 4,000 feet; rainfall, 18 inches; one farmer raised 62 bushels of winter wheat, 18 bushels of spring wheat, 18 of durum or macaroni wheat, 20 of oats, 40 of barley, 25 of corn and 65 of potatoes per acre.

Acreage Results.

"At Limon, Colorado, altitude 5,000 feet; rainfall about 16 inches; winter wheat went 32 bushels, spring wheat 28 bushels, durum wheat 30 bushels, winter rye 28 bushels, spring rye 25 bushels, spelts, 48 bushels, oats 60 bushels, barley 45 bushels, corn 45 bushels, alfalfa 4½ tons, fodder grasses 2½, brome grass 2 tons, sugar beets 15 tons, potatoes 8 tons per acre.

Acreage Results.

"At Wray, Colorado, altitude 3,500 feet; rainfall, 18 inches; winter wheat ran 45 bushels per acre, spring wheat 42, winter rye 50, spelts 50, oats 55, barley 66.

Estimated Profits.

"At Sheridan Lake, Colorado, altitude, 4,000 feet; rainfall about 17 inches, winter wheat made 35 bushels, durum wheat 35 bushels, barley 45 bushels, corn 52 bushels, alfalfa 2 tons, sugar beets 7 tons, turnips, 200 bushels and potatoes 140 bushels per acre. The man who sends in these figures estimates that land in his county, properly handled, should bring 25 per cent net profit per acre per year..

Acreage Results.

"At Byers and Bennett Colorado, altitude 5,000 feet; rainfall about 14 inches; corn made 40 bushels, wheat 40 bushels, beans 20 bushels, oats 30 bushels, alfalfa 3½ tons and other crops in proportion.

Precipation Reports.

"Of course, it must be remembered that these figures are undoubtedly maximums, for the farmers who have sent in these reports it must also be remembered, however, that the rainfall figures which I have given, represent the average through a period of years, and that in 1908 much less than this amount fell in practically all the districts mentioned. In my own district, for instance, no rain whatever, and about three inches of snow, fell between Sept. 10, 1907, and April 20, 1908, a period of more than seven months. The rainfall after that was slightly above normal, but not enough so as to make up the average for the year.

Crop Failures.

"As a result of the winter's drouth, winter wheat was largely a failure, the yields throughout the state being cut down not less than one third, and the spring and summer crops also came to maturity under distinctly unfavorable conditions.

"Gentlemen, I might continue these figures indefinitely, telling of successes on the plains of Colorado in spite of drouth and hardship. I might bring into play all the eloquence of all the minds in this assembly, if I had it, and I could not do more than justice to my thoughts of Colorado and the future of its dry land districts. Failures, in part or in whole, there may be now and then. Such failures are found everywhere, no matter what your occupation. One of the keenest minds of Wall Street, whose possessor is regarded as the richest man in Wall Street, is authority for the statement that the best he can do is to get the market right four times in seven. The Colorado dry farmer can guess the season much better than that, and he doesn't risk as much money in the process, either."

THE GOVERNOR OF COLORADO.

MR. McCOLL (presiding): "I take great pleasure in announcing that we are to have the honor of hearing Governor John F. Shafroth of Colorado. I beg to introduce the Governor."

GOVERNOR SHAFROTH: "Gentlemen of the Dry Farming Congress, I am sure as we have heard such an eloquent speech from the delegate from Colorado, it is useless for me to say anything. It seems an irony of fate that the thing which we most desire for dry farming, moisture, should have prevented the large attendance which we ought to have at this Congress. Colorado, my friends. has been one of the pioneer states in dry farming.

Objects of Congress.

"The great object and aim of this movement is to devise some way to conserve the water in the ground and that is the problem you have to solve. How can it be done? How can it be done to the best advantage? Another important question is: 'what seeds you can plant, that will endure through the dry seasons?'

Soil Treatment.

"I have noticed and I have read a little about the Campbell system and the Cooke system, as it is called here, and they possess virtues. There can be no doubt that the packing of the surface of the earth after storms induces evaporation, which evaporation does not exist after a blanket of pulverized earth is placed on the soil. And that, of course, retains the moisture in the earth and that retention may not be as great as we would like, but notwithstanding that, it will raise crops in this arid country.

Dry Land Area.

"We have a great area of land lying east of the Rocky Mountains to the One Hundredth Meridian, for this is the Meridian which congress has recognized as the dividing line between arid land and productive land. That area consists probably of seventy-five or eighty million acres above ditch, that apparently cannot be irrigated under any conditions. It is an empire in itself, and one of these days we will find that great area of land will produce large and bountiful crops.

Irrigation Reservoirs.

"One of the things which I think is most essential for every man to consider who attemps to raise crops on these arid lands, is to augment the Campbell system or the Cooke system by some process of holding a small quantity of water, it may be, for irrigation. You will find that nearly every piece of land consisting of 160, or 320 acres of land has a draw or depression of some kind where a reservoir could be constructed, small in size, but the quantity of water which will go into that each year will be a surprise to those who think this is an arid country.

Flood Water.

"In Colorado, on every railroad, on one side or the other, you will find a ditch constructed for miles and miles. The first time I saw that, because I came across the plains before they had any ditches at all along the railroads, some thirty years ago, I asked after seeing those ditches there what they were for and a railroad man told me it was necessary to have those ditches to prevent, at certain times when they have cloudbursts and great storms, the water from washing out parts of the track. That apparently was right on the plains where, of course, there was a declivity of some nature rising from the farther side of the track.

"Now, as they have found it essential to construct ditches along our railroad tracks in order to prevent washing them away, or in order to prevent the saturation of the earth so as to impair the railroad track, you can readily see that, if that moisture was conserved, was gathered together and placed in a reservoir, either above or near your farm, in the dry seasons when the resources of the Campbell system have been somewhat exhausted, one irrigation would save the entire crop, and by reason of that conservation of water, if a farmer will do it, you will find that the great portion of your crops, even in the driest years, will be saved.

Experimental Stations.

"I find we are having legislation to a considerable extent in the advancement of dry farming. Congress has before it today a bill appropriating a considerable sum of money for the establishment of experimental stations. I sent a telegram to our delegation in Congress last week, urging them to endeavor to get that bill passed at this session before it adjourns on the 4th day of March. The expectation is that those experimental farms will be placed along the sides of the railroads on perfectly dry arid lands, and that they are going to be cultivated according to the Campbell system, or the Cooke system, and they expect to make a showing so that every man on the cars that passes there will have an object lesson of what dry farming can do.

"My friends, I know that all pioneers have a hard time in the settlement of a country. I know they always have disappointments and bitter hardships, but in the long run, as Governor Brooks said this morning, the dry farmer in the arid west has not had a harder time than the pioneers of New England, or even the middle states of the Union.

320 Acre Homesteads.

"There was passed by the representative of Wyoming in Congress the other day, a bill which I think is going to make a great upward movement in this entire western country and especially in the arid lands, by an amendment which he made to the Homestead Act, which provides that a person settling on the public domain can now locate on 320 acres instead of 160 acres. That will give the farmer who is accustomed to having a farm of 160 acres, the right and privilege to alternate under

Biennial Cropping.

the Campbell system, to cultivate one-half of his farm one year, and then let is rest for a year and cultivate the other half the next, thereby conserving two years' supply of water in the land, so that when he calls upon it to meet the demands of nature for growth he will have a larger quantity by reason of having left it untilled for one year.

"My friends, I have always thought the Homestead Bill ought to have been provided for a larger acreage in the arid West than in the fertile valleys of the Mississippi, and there has been a desire on the part of Congress to permit that larger amount of land to be taken as a homestead and I am glad to know that the representative of the State of Wyoming has been a pioneer in that movement and has accomplished this great result for the benefit of the entire West.

Immigration Increasing.

"Now you will find that men who hesitated about taking up simply 160 acres will not hesitate to take up the much greater area, namely 320 acres, and I believe that that act will put an impetus into settling on the public domain to such an extent that it will not be many years before all of these arid plains will be settled by homesteaders.

"My friends, with an area of land such as we have, and the best minds on earth to devise ways in which growth can be made, it seems to me that under this system which we are attemping now of scientific farming, under the selection of seeds and under the greater area which persons can take up land on the public domain, all this area between the Rocky Mountains and the One Hundredth Meridian is going to be a land where there will be prosperity; land which will be placed in private ownership; land that will be subject to taxation and will deliver taxes for the county and state governments, and which will assure our states a happy and prosperous future. This condition is what we want. We are meeting here to devise means of accomplishing this end and I have no doubt that that end one day will be reached.

"I notice that the Governors of the various states, nearly all of them have sent invitations to this Congress to meet in their state at the next annual meeting thereof, and I want to tell you we have a beautiful city about 100 miles below here called the city of Denver. (Applause.) That we are in the habit of having conventions there from the national convention of a political party down to our own state and county conventions, and the conventions of numerous congresses which exist in that state and also throughout the Union, and I want to say to you, if you come down there we will treat you right and show you a beautiful city, and we will show you practical dry farming."

IDAHO.

In responding for Idaho, Mr. F. C. Bowman, of Idaho Falls, said:

"Inasmuch as Dean Elliott, a delegate from our state, is down on the program for an address on what dry farming has done for Idaho, I will make the present State report very brief. The meaning of the word Idaho in the Indian language is 'The Gem of the Mountains,' and the Indian who selected that name must have been not only a poet, but a prophet. We undoubtedly have more natural resources than any other state in this great West. We have minerals of all kinds and descriptions. We have timber. We have grass land. We raise fruit on our land; in fact, we raise everything but bananas, and I have a man with me from Idaho who can make you believe we raise bananas, but I cannot.

Irrigation in Idaho.

"We have the choicest area of land capable of irrigation in the country, and we have ample, in fact an over-abundance of water to irrigate it, and therefore it took some little time for the dry farming movement to get hold of us. We have so much land that we can irrigate, and so much water to irrigate it with that we didn't think much about dry farming. But after the second Dry Farming Congress, a year ago, our people took hold of this movement. They saw what it had accomplished in the past.

Dry Land Area.

"Our state applied to the government to get 75,000 acres of land on which it is impossible to get water and 30,000 acres of this land is now in course of cultivation. That which was cultivated last year showed unquestioned success.

Acreage Results.

"Our crops range, in various sections of the state, from 20 to 50 bushels to the acre, that is on dry farm land. As I said before, Mr. Elliott in his paper will furnish all these statistics of our state and it will be a very fine address. For me to go on now and tell you what we have done would simply be encroaching on the ground. We have a state we are proud of. We have a state that any honest, energetic man can come to and make money and have a home and good health, and be happy."

KANSAS.

Mr. C. K. McClelland, of Hays, responded for Kansas as follows:

"I have the honor today to represent a state, one of those mentioned here this morning as having given a black eye to dry farming.

Crop Failures.

"The number of failures made in the early days in Kansas tended in a large degree to discourage settlement in the semi-arid regions of the West. However, through investigation of the subject and iron pluck and persistence, Kansas has recovered from that blow and is again coming to the front. We have learned in particular to take advantage of these torrential downpours which were mentioned here today, by loosening up the soil to induce percolation.

Precipitation Reports.

"The rainfall is not the same in all sections of our country. While we had six inches of rain one fall, one of my neighbors six miles north had six inches of rain in one afternoon. That is one of the trials we have to contend with. While the rainfall in one part of the country will be 25 inches in a year, in another part it will be as low as 15 or 16 inches.

"We come here wanting information along other lines than those mentioned here today. We have heard of the conservation of moisture in the soil, and the principles applied to that in dry farming, but there is a complication to the conservation of moisture, which we have found a great problem. Nearly all the speakers who have preceded me mention the conservation of moisture. One or two mentioned the improvement of seed and seed that would do well in the semi-arid region. But the complication we want information on is how to conserve the moisture and at the same time maintain the fertility of our soil

"Cultivation of the soil exhausts the humus of the soil, and the soil in our country hasn't got any too much humus anyway. One gentleman mentioned the rotation of crops, but most all the others mentioned simply the conservation of moisture. We want to conserve the moisture and at the same time maintain the fertility. We want to know how to increase the humus in our soil. Now another complication in our dry farming is this, that the more you work land the tendency is to make the soil finer; then there comes along one of those famous Kansas zephyrs at about 70 miles an hour, and it is goodbye oats, barley, wheat, soil and everything else.

Soil Fertility.

"So the problem isn't simply the conservation of moisture, it is the conservation of the moisture, the maintenance of the fertility and the prevention of blowing, as well as the selection of seeds and the crops that will do the best on the dry farming areas. We want information along those lines, and we hope the gentlemen in this Congress in their talks will give us some information that will help us keep the fertility in our soil and also keep them from blowing. I thank you."

DISCUSSION.

By C. C. Williams, of Colorado:

"Mr. Chairman—If Western Kansas is anything like Eastern Colorado, and I do not understand that God made the state lines, the gentleman from Kansas has in part answered his own question.

Soil Fertility.

"We in eastern Colorado have found that, to maintain the fertility of our soils in the face of constant cropping, we must feed everything that we raise. The growing of small grains for market to the exclusion of other crops has not been found to be a commercial success in our country, figuring only from the basis of cost and of gross returns. At the same time the practice results in removing from the land a greater quantity of necessary nutriment than is even dreamed of by many of us who are today working the virgin, virile soils of the great West.

Live Stock Profitable.

"On the other hand, the process of stock feeding means that, properly handled, you utilize all your waste, you market only the finished product, thereby retaining for yourselves the profit on the crop as well as that on the stock you feed; you send your crops to market on the hoof, thereby reducing your freight rates five to one; and, best of all, you return to the land practically 75 per cent of the crops you raise, in the form of manure. Carry on your land every head of stock that you can raise feed for; buy feed, if necessary, rather than sell it; grow only enough wheat to fit in with a crop rotation system suitable to your soil and climate; make some form of leguminous crop a part of that rotation; feed your land continually and consistently with manure and you will never lose soil fertility.

Crop Rotation.

MONTANA.

Dr. W. X. Sudduth, of Billings, responded for Montana:

"Ladies and Gentlemen and Fellow Delegates to the Trans-Missouri Dry Farming Congress—Your Executive Committee has laid upon me rather a large task. How large, those of you who are not acquainted with the state of Montana cannot realize. When you come to consider that its boundary along the Canadian line is 570 miles, and that from the Wyoming line to the Canadian line is 300 miles, and that it includes an area of better than 145,000 square miles, approximately over 93,000,000 acres, you can see what a task I have today to represent the entire state. Now let me compare this a little further. Ninety-three million acres of land! Why, it would take Indiana, Illinois, Iowa and a goodly portion of Maine to fill up the boundary lines of the state of Montana. We have a large mountainous area, and after deducting the so-called mountainous portions, we have yet left an agricultural portion that is as large as the state of Iowa, and I know that state from one end to the other. There is more good land in the state of Iowa from corner to corner than in any other state in the Union. But, I say without fear of contradiction, that this area of cultivated land in Montana will produce more pounds of grain that the state of Iowa. Not only that, but commencing in the Big Horn Basin in the northern portion of Wyoming, and we have an extent of country nearly 300 miles long extending from the Rocky Mountains east 150 miles that has the most equable climate of any section of the whole United States. That area is just about the area of the state of Illinois, and as I have said time and time again to friends back in my native state of Illinois, that we can raise more grain acre for acre in that section, the belt comprised in that section I have just described, than they can in the whole state of Illinois. Now out of this, one and a quarter million acres is irrigated land, and there is 6,000,000 acres possible of irrigation in this tract.

Dry Land Area.

"After deducting all these portions we yet have 25,000,000 acres above the ditch of good arible land in the state of Montana. I have not included in this the mountain valleys. We do not appreciate what we have in those mountain valleys. It has been my good fortune to spend several years in Europe, and I have seen dairy farms there in the mountains nestling up in the hills with the perpetual snow lying above them. I have seen profitable business carried on there and happy communities living there, and we have places for thousands and thousands of prosperous homes in the mountain areas in the state of Montana.

Immigration Increasing.

"Considerable attention has been given in the last few years to the development of this land above the ditch. It has attracted settlers from the East that are coming out in large numbers, and we of Montana feel that we have a moral obligation resting on ourselves to educate these new settlers in the methods adapted to the locality in which they locate, which will produce crops and enable them to make comfortable homes.

Agricultural College Work.

"I now hold in my hand the last word from Montana on this subject, right from the press, Bulletin No. 1, issued by the Farmer's Institute office, and edited by Proessor F. S. Cooley, and contributed to by members of the State Agricultural College faculty, and it is right up to date, with 228 pages teeming with information and statistics regarding what has been done and what can be done in the state of Montana. It is profusely illustrated and can be obtained by writing Professor F. S. Cooley, at Bozeman, Montana, and you will find it is right up to the minute.

Soil Treatment.

"How large a proportion of the farmers of the semi-arid belt are practicing really scientific methods of soil culture? I am free to admit that it is very difficult to do the work just right. One of the rules that is insisted upon at Broadview is, 'unless you can do it right, don't do it at all—wait, wait, even if it cannot be done until next season. To plow land when the physical conditions are not the very best, to put seed into the soil where seed bed and moisture are not just right, is simply inviting failure.'

Cost of Production.

"According to the best information I can gather, it takes fifteen bushels of wheat to pay the cost of putting in and harvesting a crop on an acre of wheat land, and unless the yield can be increased over fifteen bushels per acre, then the farmer will have nothing to show for his investment, though the small farmer, living on his own farm and doing his own work, might continue to hold his own on a wage basis so long as he met with no misfortune, but the man who aspires to farm on a large scale must necessarily adopt scientific methods that insure maximum results or he will surely end in bankruptcy.

Failures and Cause.

"Failures there have been, and failures there will be so long as men practice haphazard mehods, but failures there need not be if scientific methods of soil culture are closely followed in sections where the physical conditions of the soil will permit of a thorough preparation of the seed bed and where precipitation amounts to ten or more inches during the growing season.

"The vast majority of settlers in the semi-arid belt are practicing dry farming, and very dry farming at that. Little or no effort is made to conserve moisture for each season's crops, let alone storing up moisture for succeeding crops.

Soil Treatment.

"Few practice harrowing the growing crop to break up the capillaries and prevent rapid evaporation following rains after wheat is up. Almost no one follows the reaper with the disc harrow to prevent the loss of hydroscopic and residual moisture that may not have been exhausted by the growing crop. Too often the stubble is left to lie and bake in the autumn sun, and when the plows are started in the fall the ground breaks up in such a coarse, lumpy condition that it is impossible to secure an ideal seed bed. Very few adopt any method to pack the soil after turning the stubble, but leave the ground just as the mold board turns it, with the result that, even if the soil had been in good condition to plow, it dries down to the full depth of the plowing, be that four, five or ten inches. Very few even harrow the surface, and a less number use a packer. When these vitally essential points in proper preparation of the soil are omitted at the time when they should be looked after, no amount of subsequent disking, harrowing and rolling can put the seed bed in an ideal condition. No real progress in moisture conservation can be had until these A B C's of the system have been mastered and put into practice as a matter of course.

Dry Farming Misnomer.

"I object to the term 'dry farming' because it does not stand for anything except to differentiate it from irrigation. I am coming to speak of bench farms as distinguished from irrigated farms in the valleys, while I have no real objectons to the name 'dry farm' in itself, did it not in too many instances call to mind the slovenly, haphazard methods of the improvident settler who never made good anywhere and never will. I am not afraid of hurting the feelings of any who may hear this paper, for the reason that the class I allude to never read any of the agricultural papers that are published for their special benefit.

Live Stock Profitable.

"Then again, in too many instances dry farming has come to be considered as a cereal proposition, whereas the farm in the semi-arid section should be a livestock proposition and small grain should be secondary. This is especially true of mountainous sections, where free range is more or less plentiful.

Dairy Stock and Fowl.

"The attention of the small farmer should be turned to the dairy, and pigs and chickens should occupy a large place in his farm operations.

Forage Crops Necessary.

"In order to handle livestock successfully more attention should be given to forage crops than is generally the case. Soiling for the cows should be followed in order to secure the best results, and moisture conservation is an absolute necessity.

Precipitation Reports.

"The value of moisture conservation in Eastern Montana has been demonstrated to the fullest degree during the past season. From July, 1907, to April, 1908, the preciptation, including the snowfall, was less than three inches. None of this went into the ground because of frost. The precipitation for April, 1908, was 1.04; for May, 5.20, and for June 2.85 inches, the total precipitation for the three months being 9.09 inches.

Acreage Results.

"On this low precipitation turkey red winter wheat produced 30 bushels per acre, and tested 59½ pounds per bushel; barley yielded 20 bushels, which tested 60 pounds per bushel; spring wheat made 15 bushels per acre and tested 60 pounds per bushel. At no time did the grain or garden truck show any lack of moisture.

Drouth Results.

"The falling down in the yields during 1908, as compared with 1907, can only be accounted for by the long continued hot spell that extended from the middle of June until July 20, when the excessive drouth was broken by a good rain. Until the first day of July I fully believed that my spring wheat would make at least 25 bushels, my winter wheat between 40 and 45 bushels and my barley field 40 bushels per acre The grain was all in the milk and plump and full, the winter wheat showing six rows. It was not until the last few days before cutting that the barley showed any signs of blight. Then the ends of the heads turned white, and black grains began to appear. Then, for the first time, we realized that the yield was going to be lower than the previous year.

Causes of Failure.

"From a careful study of the situation I am led to believe that the partial failure was due to the heat and not to any lack of moisture. The hot spell was phenomenal for that section, being the longest and hottest period ever known in Eastern Montana. The nights, however, were cool, which undoubtedly prevented a more serious loss, or perhaps a more or less total failure.

Results of Methodical Work.

"In sections lying farther to the north, where farming methods are more or less slovenly, crop failure was a rule, and fair to good crops the exception; but even there, wherever a farmer took any special care to prepare his seed bed and conserve the moisture, fair to good crops were the result.

Soil Treatment.

"The most marked example of the benefit of thorough tillage was to be observed in the orchard at Broadview. There the soil was kept in a fine tilth by using the Acme harrow, and at no time during the summer was there any lack of moisture, although it did not rain from June 10 until July 20, as was said before. The wild sod on land lying just outside the orchard fence was baked and dry, and the breaking plows had to be laid aside about the middle of June. The engine gang plows were run a little later, but all breaking had to be stopped by July 1, not to be started again until the fall rains set in.

"I have gone thus carefully into the situation, and from what I can learn similar or worse conditions existed to the east of us, and profitable crops were the exception. Now, if the yields above quoted without a single failure can be obtained on a precipitation of twelve inches in an unprecedentedly hot season by means of scientific soil culture, then I feel sure that we can say that an insurance has been found at last against failure; and I reiterate what I have said many times before, that he who follows Mr. Campbell's methods as closely as the local conditions will allow him, will never have a crop failure. While it is true that some years, such as the past, the yield may be cut down, yet where proper precautions are taken in due time his methods will insure a profitable yield in sections where the rainfall does not fall less than nine or ten inches.

Campbell System.

Advice for New Settlers.

"I have been asked to outline a plan whereby a new settler can make good the first season, and would suggest the following:

"He should move onto the land he intends to improve by November 1, at the latest. It would be better for him to be there by October 1, so as to get up his house before winter sets in, although in this section of Montana people winter in tents and do not suffer greatly. Still, to a person coming from the more humid east the better plan is to put up as comfortable a house as he can afford. During the winter months material can be gotten on the ground for stables, corrals and fencing, and the early spring months can thus be left free to break up the new sod. If a person waits until spring to move onto his claim, too often the summer is well along before he has gotten up his house, stables and corrals, and the dry weather sets in before he fairly gets started breaking, and the result is he loses a whole year.

Advice for New Settlers.

"Let us suppose then that the new settler has moved onto his claim in October, has gotten his buildings well out of the way and is ready to start in breaking by the middle of March, or by the first of April at the latest. His horses should have been grained all winter, and thus be in good shape for a good spring's work. He should have at least four good 1,400 pound horses to pull a 14-inch sulky plow, and five would be better; he would thus have an extra horse to change off with and run his seeder. He should plow shallow, say 2½ to 3 inches, if his sod is tough, and should roll each half day's breaking before leaving the field, so as to secure a sod mulch and conserve all the moisture that may fall during the spring and summer. He should count on getting 60 days breaking during April, May and June, besides doing the other work that must be done to put in a crop. This should give him 150 acres broken up and leave him 10 acres wild pasture on his homestead, which will be all that he will need if he follows 'soiling methods' of handling his livestock.

Soil Treatment.

Dairy Stock and Horses.

"The plan as here outlined presupposes that the settler has brought ten grade Jersey heifers, bred to calves in March, and ten Duroc Jersey gilts bred to pigs in April, out with him in his car; also brought corn enough with him to run him through the first winter and spring. His horses he had better purchase where he locates, as horses brought from the states do not do well the first season and will not stand up to the spring work like horses that are acclimated.

Forage Crops—Artichokes.

"Now, as to crops to be put in to take care of the amount of livestock above described. In the first place, on the first breaking, artichokes should be dropped in every second furrow close up to the free edge of the sod. Two furrows should then be plowed and another row of tubers planted. The rows would then be 28 inches apart, which would give them plenty of room. The sod should be rolled so as to make a perfect sod mulch, and the pulverizer run over it once, which is all the attention the crop will need, as there will be no weeds the first season. At least five acres of the very first plowing should be put into artichokes, and the next ten acres should be put into potatoes. Under suitable conditions the field will run from 50 to 150 bushels per acre.

Forage Crops—Field Peas.

"The next crop to put in is Canadian peas. For these the sod should be single disked. Twenty-five acres of peas sown broadcast and then disked in for hay and then twenty-five acres that are intended to thresh should be drilled in with a Planet Junior seeder, drawn by a single horse.

Root Crops—Beets.

"Twenty-five acres should be put in roots, such as sugar beets, turnips, carrots and rutabagas Five acres should next be put in soy beans. Twenty-five acres can then be put in bald barley. Ten acres can be put into macaroni wheat, and last twenty acres should be seeded to alfalfa.

Alfalfa a Soil Preparation.

"A good stand of alfalfa can be gotten on sod just as easy as a stand of flax. The seed bed for this later should be thoroughly prepared by disking and harrowing, and the seed drilled in and harrowed at once, after which it must not be interfered with by harrowing, as the plant is very tender and is easily broken off. It will not furnish much forage the first year, and hogs and cattle and horses must be kept off

Chicken Feeding.

it. The chickens will, however, enjoy it and repay in abundant eggs. The second season it will furnish a soil crop for cows and hogs during the summer and hay for winter.

Canadian Field Peas.

"In this connection I want to say that the Canadian peas will furnish all the soil crop needed the first year. The land that has been in roots and peas can be back set in the fall and farmed the second year the same as if it had been summer fallowed. This would give nearly

Crop Rotation.

90 acres the second season for barley or macaroni wheat. The 30 acres of barley and macaroni wheat land, which should be fall plowed, can be used for roots, peas and tubers the second season. By growing a succession of intertilled crops the land can be cropped every year, or at

Seeding Methods.

least three crops out of four years can be grown successfully. After the first year, however, all root crops, peas and beans should be drilled in rows as they can be tilled.

"By following out a system as above outlined, the new settler can make good from the very first year, and by the third year he will be ahead and ready to buy out his less provident neighbor, who is depending upon grain crops alone.

Homestead Selection.

"Now as to the selection of a homestead on which to locate. As livestock is an essential to the highest success in farming in the semi-arid belt, a location should be made adjacent to as much free range as possible. Naturally this will take the settler into the more broken sections of the country, where he can find some smooth land, on the bench or along some small stream, where small diversion dams may be put in and flood waters turned out on small bottoms for orchard and garden, thus insuring a comfortable home life, as plenty of domestic and stock water is absolutely essential to success.

Dry Farmed Fruits.

"All kinds of small fruit and the hardiest varieties of apples and plums do well on the bench lands of Montana, and there is no reason why an industrial farmer should not live as well or better than the average farmer in the corn belt. No more money is required to carry out the plan as above outlined than would be needed to stock and run a 160-acre farm in Iowa, Illinois or Wisconsin, and the net returns should be greater from the very first year than they would be on a rented farm in the corn belt.

First Year Returns.

"Let us see what returns should be reasonably expected from 160 acres the first year. First, as to the amount of forage to be raised the first year:

"Twenty-five acres of Canadian peas cut for hay would yield five tons per acre, making 125 tons, worth at the lowest $5 a ton, or $625. Twenty-five acres of peas, left to ripen, would yield seed worth $375, and some hay. Five acres of soy beans would yield seed worth $125. Five acres of artichokes would yield, at a low estimate, 75 bushels, and ten acres of potatoes would yield a similar amount. The fifteen acres of tubers then would give 1,000 bushels, worth 50 cents a bushel, or $500.

Yields of Root Crops.

"Five tons to the acre would be a low yield for the root crops, and as twenty-five acres were to be put in this character of crops, and they are worth $5 per ton for feeding livestock, the roots alone would give, say, $625.

Cereal Yields.

"The barley would yield twenty-five bushels on sod, making 625 bushels, worth 75 cents a bushel, or $400; and the ten acres of macaroni wheat would yield 250 bushels, at 60 cents per bushel, of $150. The alfalfa would not yield any cash returns the first year.

Financial Estimates.

"Now let us sum up the matter and note the cost of putting in the above crops and harvesting the same, and see how the accounts would balance: Peas, hay, $625; peas, seed, $375; beans, seed, $125; tubers, $500; roots, $625; barley, $400; macaroni wheat, $150; total, $2,900; less expense putting in crop, $1,500, leaves $1,400; less expense marketing, $400; net, $1,000.

"Or, put it this way:

Livestock Results.

"Say it took all the crop to carry the livestock and fit it for market, the accounts would stand as follows: Ten cows produce 1,000 pounds of butter at 40 cents per pound, $400; 10 calves, at $15 per head, $150; 10 sows produce two litters of five pigs each, making 100 head, weighing at six months 150 pounds each, at 8 cents per pound, $1,200; 100 hens produce eggs worth $250; raise 300 chicks worth $250; have lelft over for next year, hay and grain, $650; total, $2,900; allowing for putting in and harvesting crop, $1,500; total $1,400; allowing for looking after livestock, $400; net profit for the first year, $1,000.

"Cut it in two if you like, and still it is not a bad showing for the new settler on the bench lands of the semi-arid belt.

Soil Treatment.

"The first year and succeeding years should make better returns as the wild nature of the soil is killed out and humus is added to the land, which puts it in better shape to retain the moisture. The secret of success the first season, howevr, lies in shallow plowing and immediately rolling the sod, so as to form a sod mulch that serves to conserve the moisture and makes success possible the first year."

NEW MEXICO.

Mr. George A. Fleming, of Las Vegas, New Mexico, said:

"Mr. Chairman and Gentlemen of the Convention—I bring you greetings from New Mexico. New Mexico is not largely represented, but the few of us who are here are certainly full of enthusiasm and will imbibe as much of the information to be imparted here as possible and carry it home and spead it as broadly as possible. I had no expectation of addressing you at all today. We were to have been represented here by Col. R. E. Twitchell, of Las Vegas, New Mexico, who was secretary of the Sixteenth Irrigation Congress, but who is as enthusiastic a dry farmer as an irrigationist, and who has all the facts and figures of the products and resources of New Mexico at his finger tips. Unfortunately, neither he or Governor Curry were able to be present. They both regret this, and while they regret it, we regret it a great deal more. As I say, I have not expected to make any remarks at all and after the remarks which you have heard from other states, it would be futile for me to attempt to go into details to tell what New Mexico has done. I will say that Prof. Tinsley, of the State Agricultural College, is on the program for an address and he will undoubtedly enlighten you more intelligently than any other man in New Mexico could do as to what has been accomplished there in the dry farming movement.

Statehood Fight.

"New Mexico, as you know, in conjunction with Arizona, has been knocking at the doors of Congress for statehood for years and years, to be exact, since 1850, and their claim has been rejected time after time. They did become kind enough a few years ago to offer to admit those two great territories as one great state. New Mexico rather than stay out in the cold any longer voted on the proposition to accept. We felt that two senators and the representation to which we would be entitled would give us a standing which we didn't have. We have a voteless delegate in Congress now and we feel the injustice of it very much, and

Dry Farming Advancement.

I want to say to you that the dry farming movement has done more to advance our cause for statehood than any other one thing has done in the past twenty years.

Immigration Increasing.

"We have had about 30,000 homestead settlers come into the territory of New Mexico since the dry farming movement has become generally known. That does not take into account the settlers who have come in there and bought land. Those figures are taken from the records of the land offices in the various land divisions of the territory. The same thing is true of Arizona, while not to so great an extent, at the same time the population of those territories is increasing at an unbounded rate. In our own district around Las Vegas we have had no public land open to entry and have had to depend on the sale of lands of the Las Vegas grant. You who are familiar with the conditions in this section of the country know it is harder to get settlers where the land is sold than it is where homesteads can be taken up. But I am happy to say that through the efforts of one or two land companies who are operating there, we are getting settlers at the present time and we are seeing what it means to have men come out with a carload of horses, cattle, hogs and farm implements and we will realize within a year or two exactly what it means to a town to have the country around it settled up. We have been handicapped by the native element who are, to put it mildly, shiftless.

Failures and Cause.

"We often say that if one of our native farmers were put down on the richest farm in Illinois, Iowa or Indiana, he would be more apt to starve to death than not. Why? Simply because he wouldn't work enough to keep the weeds down. They would kill him out. But in the valley where they have farmed, they have made a living for themselves and families for years, and we know if the natives can do that with their shiftless method, the English farmers coming in can do it much more so. We have had another demonstration which has opened the eyes of many people—during the great A. R. U. strike a number of railroad men were thrown out of employment and had no chance for reinstatement on any railroad. They cast about for means to make a livelihood and many of them went out on the high Mesa east of Raton without any literature or dry farming propaganda and started to work out their own salvation in the farming line, and to tell you they have been more than successful is putting it mildly. They prove year after year what can be done with dry farming lands. Just one other thing. One of the worst things which we have to contend with is the skepticism and unbelief of the old-time residents of that country.

Prejudice Against Dry Farming.

"They say, 'This is a stockman's country; we know, we have lived here for years; we have seen it tried time and time again, and it took the hardest work to overcome it.' But I am happy to say at least three of the people who were either sceptical openly or doubtful have proven by going on the land which they owned and farming it, that they were wrong. It is our proudest moment when we can take people who come there to these men and say, 'Tell us what your experience has been.'

Dry Land Area.

"We have an enormous territory in the area of New Mexico in addition to what has been already taken up, which is still open to entry or sale and in going into that feature of it I think Prof. Tinsley will bear me out in saying that the intelligent farmers who are coming in there today, are the ones who are going to make good. There are people, just as has been said on the platform today, there are people who are indolent and who will not work and they are the people who will make failures, but I contend that that is no more true of farming than of any other class of business. How many men go into the grocery business and make a success? How many men in each town can you think of who are modern and up-to-date in their methods?

Value of the Congress.

"It is just such gatherings as this that is the salvation of the dry farming movement, in educating the people that they must follow educational methods in order to be successful."

OKLAHOMA.

Anders L. Mordt, of Guymon, Oklahoma, responded for that state as follows:

"It is with peculiar feelings I stand here, given an opportunity to address an assembly of the most important men of the West. The cause we are here to promote is growing rapidly and the most intellectual powers of all the western states where the conditions are such as to demand certain new scientific methods of agriculture, are engaging themselves in the study of these conditions and methods.

"Oklahoma, especially the western one-half, joins hands in the movement. As one who has lived in Oklahoma five years, and who has carefully studied the farming conditions, I am convinced that we could double our average yield of our crops if we applied the system of dry farming. During the last year the farmers have begun to realize this fact and quite a number have started to farm under the Campbell system with good results.

Farmers' Institute.

"The business men of the cities have realized the same. For instance, in Guymon, my home town, the farmers held a Farmer's Institute meeting last fall, exhibiting crops and discussing the different methods of farming. We succeeded in getting Mr. Campbell down to give us a lecture on the Campbell system, and the farmers were so delighted and interested that it was hard for Mr. Campbell to get away.

Campbell System.

"The result of our first work is, that from four to five hundred of our farmers read and study the Campbell system, as explained in his magazines, and all of them have more or less acres that they at present are working according to Campbell's instruction. Farmers who already have tried it have demonstrated to themselves that they profit by following Campbell.

"It is enough to say that Oklahoma is awakening to the fact that something must be done, and she, the glorious, young, energetic state, is going to do it. I want to state to you that the western part of Oklahoma is with you with soul, heart and body. She extends through her poor servant, her deep-felt gratitude towards the Congress, and will always be ready to do her share.

Immigration Problem.

"There is another point I want to discuss with you, and that is how we can get energetic, intelligent farmers to our western states. Farmers who are able and willing to push the coming part of the United States to the front.

"In this matter I have been called upon to make clear a few points as to Scandinavian immigration to the Trans-Missouri field, as the Scandinavians of this country represent a prominent part of the best, most progressive and successful farmers and pioneers. The reason why I have been called upon in this matter is that I have been engaged in extensive Scandinavian immigration work for five years, and have made a success of it. I believe I can say I am the only Scandinavian colonizer who devotes all of his time to this branch of immigration to the West.

Scandinavian Immigration.

"Scandinavians in the United States, born in the old country, number a little less than two million people; counting the first generation born here they exceed four million. Counting Scandinavians born in the old country and all their generations here, they number over five millions, and in these figures we do not include Leif Erickson, who came here in the year 1,000, nor George Washington, who traces his ancestors to an old Norwegian warrior family from Orkney Islands, which you have very likely read about in the letter of Wm. E. Curtis in the Chicago 'Record-Herald.'

"The Scandinavian immigration has yearly been between fifty and one hundred thousand, except in 1908, when the financial crisis cut down this figure.

Scandinavian Farmers.

"The overwhelming majority of Scandinavian immigrants belong to the farming class. While many other nationalities, more or less, seek the cities and big towns, you will find according to the United States census that the Scandinavians lead all other nationalities, as land owners, natives not excepted. Three-fourths of the Scandinavians are rural people, and one-fourth city people. Of the Norwegian only one-fifth live in cities. This shows the Scandinavians want lands and take to lands.

"We all know the Scandinavians represent one of the leading factors in the development of the Northwest. I believe it is fair to state that they can hold their own against any other nationality. They may not be as good truck farmers as, for instance, the Germans, but as corn and grain farmers, they cannot be beaten.

"They have been great pioneers in the entire Northwest, and they were and are well fitted for this, as they are more enduring and more patient than any other nationality. Take, for instance, Goodhue County in Minnesota, where they in the early days settled in with Americans, Germans, Irish and others. The Indian wars, the grasshoppers, the drouth, hard winters, and distant markets were conditions to be overcome. The result is that today you can find that the Norwegians are the owners of the entire county

"The facts remain, however, that wherever the Scandinavians settled, lands enhanced in value rapidly, and they were soon forced to seek our further and further West, looking for new fields to lay under the plow. Thus into South Dakota and further on to North Dakota they pushed, where the Norwegians alone today represent the biggest one element in the State. Here in the western portion of the latter state we find the connecting link between the old settlements and the Trans-Missouri fields.

"We also find strong Scandinavian settlements in Nebraska and Kansas. Their hunger for land has pushed them across the Missouri, along the whole line from Canada to the south line of Kansas. One will find them today right at it, still pushing forward

"At present, however, the Scandinavians are vacillating; the old field is gone, the cheap lands of the northwest are gone, and now it is up to you and to all of us to find them a new opening. Canada is a great rival. Thousands have gone and will go. But the majority seem undecided as to where to go. Here it is where we shall have our future field, among the Scandinavians. We cannot afford to lose sight of them in this move, as we then would lose the strongest pioneer element we have.

"Any country will benefit by strong immigration of Scandinavians, as they will develop the agricultural possibilities quicker than the average and create prosperous conditions. Another thing; the Scandinavians can "work and wait" as no other nationality. The next question is, since we do want them, how shall we get them? We need a method here as elsewhere, where something is to be accomplished.

"The Scandinavians are law abiding, school and church loving people. They are conservative, careful and judicious, rather slow in making up their minds, but, when it is made up, the Scandinavian is there to carry out what has been planned. They are not fast money makers, but the average Scandinavian will die leaving his family in absolutely independent circumstances. The average wealth is $1,600 per capita, or about $10,000 per family Knowing this, we must plan to interest them in a way that awakens their confidence.

"The only way to reach the Scandinavians and to get them to a new country is to offer them a colony. Here some one may object to colonies, and say we do not want any clannish work here. Well, someone may look at it this way, but a broad-minded man will easily see that it is not the clannish feeling that dictates the colony, but the love for their own church. Again, someone may say, it is not necessary to offer a colony, and that he knows Scandinavians who have moved out among strangers and mingled with them as with their own nationalities. This may be true, but there are few instances. The strongest set, the set that would would build up a country, are still at home around the churches. They are Lutherans, and want to remain Lutherans, and their only chance is a colony. The next thing of importance is to get their confidence. Give them a true idea of what they can expect when coming here.

Objectional Immigration Methods.

"The method of today used to get Eastern people to the West is very objectionable. 'Put them in a sleeper, take up their tickets so they cannot slip away, guard them, watch them so nobody talks with them and don't let them get next to other prices, sell them and ship them back home at once.' Many real estate men apply this and make money by it, but the country suffers as we only get suckers here and the business men of the farms stay at home.

"I have several times talked with the railroads about why they do not advertise the new openings in the Scandinavian press more than they do. The answer has been, "It doesn't pay, we can't get them to move.' Now, Mr. John Sebastian, of the Rock Island, can testify that I have made a great success in starting the Scandinavians West. Now why is it?

Desirable Immigration.

"It is easy to explain. I offer them colonies. I guarantee churches and schools. If they cannot afford it themselves, I will build them myself and stand all expenses. I do not go after poor people, as poor people will not make a success of farming here. I tell them they need one thousand dollars for things outside of the investment of the land and house. I make the first year as easy as possible and never call for a payment until the second year after the first payment is made, as the first year is the hardest. However many pay the farms out at once. I believe that if the country does not stand inspection and investigation it is a crime to sell lands to people who are barred from information through cunning. It is just the same as obtaining money under false pretenses, therefore, I throw the country open and let them investigate wherever thy wish. I give them a taste of what they can expect by telling them about the dry farming methods. I have translated chapters of Campbell's manual and have sent them out to tell their story, covering summer fallow, the dust, mulch blanket, sub-surface packing, etc. I avoid the great expenses connected with the complicated system of agents and also private sleepers and private trains. They are not necessary but for those who want to bar their landseekers from getting desirable information. I use sleepers, but my home-seekers pay their share of the expenses.

"I use good conservative advertisements in such papers as 'Skandinaven,' 'Decorah Posten,' 'Svenske Tribunen,' 'Danske Pioneren.' I never exaggerate, and I am persistent, insistent and consistent.

"Now, if any of you are interested in what I have had to say, I am honored. And if I shall be the means of starting a more general Scandinavian immigration to this part of the United States, I have reached my goal today. I shall always be willing to assist in anything that is to the betterment of the Trans-Missouri field And, I am honored by being identified as one of you.

"Oklahoma wishes The Trans-Missouri Dry Farming Congress the greatest success and hopes it will prosper so that we can count every energetic, intelligent and progressive citizen of this territory a member."

NOMINATIONS FOR OFFICERS.

Chairman McColl announced that all nominations for the committeemen must be placed in the hands of the Secretary before the opening of the evening session. Delegations were urged to meet at the close of the session for the purpose of making selctions.

OREGON.

William D. Hanly, of Burns, Oregon, not being able to be present, sent the following letter, which was read by Chairman McColl:

"Portland, Oregon, February 20, 1909.

"John T. Burns, Secretary, Cheyenne, Wyoming.

"My Dear Mr. Burns—Have been holding off answering yours of the 4th inst. regarding my attending The Trans-Missouri Dry Farming Congress at Cheyenne, and will say that I am very sorry to inform you that it is impossible for me to attend. Have been working very hard with a large committee of the solid people of this state to get a constitutional amendment to develop the class of land that must be made to produce by scientific cultivation, and will say that this is the most important development in the state of Oregon, as the big half of the agricultural state depends on scientific farming, as there is a very small part of the proportion of the whole area that can ever be reclaimed by irrigation, and but few people have studied the great difference between the silt deposit land in valleys, and the land that is in place on the rolling hills, as the valley lands are selected and light from the rolling hills and left the more solid and better provided to hold the moisture in place, which will be reclaimed as easily by scientific farming as the other will be by irrigation. And now that we are confronted by the new condition that the Whole United States is short on the common products of meat and bread, this great problem is a necessity, as in the last ten years we have seen corn and wheat fully doubled in price, never to get less, if the whole arid part of the country is developed to the highest state of cultivation. I want to congratulate your organization and be placed on your list as an active member, and hope in the future that I will be able to attend and render you what assistance may be possible in this great pioneer work of education, as it has passed the stage where results by practical men is no longer a question.

Leglisation Proposed.

Soil Conditons.

Food Problem.

"Wishing you success, and hoping that you will hold the next meeting at some point farther West, and that your next meeting will bring you a big strong delegation from the state of Oregon of good workers that will lend aid to this great cause, I am,

"Very truly yours,
"WM. D. HANLEY."

TEXAS.

Mr. G. A. Martin, editor of the Herald, El Paso, Texas, responded as follows for Texas:

"Mr. Chairman, Ladies and Gentlemen—Coming as I do from the largest city in the largest county in the largest Congressional district in the largest state in the greatest nation of the world, I feel hardly equal to the occasion. The speakers who have preceded me have spoken of the immensity of their states, but as you all know, Texas is the greatest in area of any state in the Union. My own county is about as large as most all of the New England States, eliminating Maine. Across the state of Texas it is a greater distance from El Paso to the Sabine River on the opposite side of the state than it is from El Paso to Cheyenne, Wyoming, and I was three days and three nights getting to Cheyenne, Wyoming.

"It is needless for me to say to this convention that the so-called science of dry farming is not new, for people were raising food-stuffs and living in semi-arid regions long before anybody ever thought of turning a river uphill.

Dry Farming in Palestine.

"We know that the people in Palestine and Northern Africa have been raising successful crops without irrigation a lot longer than William E. Curtis has been writing letters for the Chicago papers.

"But down in my section of the country we do not have to go back to Asia or Africa to learn that the people have practiced dry farming for ages, for we have evidences right at home of their success before thy knew what it was to take the water from the rivers by canal and divert it to the lands susceptible of irrigation.

Prehistoric Dry Farming.

"Down in Northern Mexico are found the ruins of farms of a prehistoric race without any evidences of canals; in fact, unless the country was considerably different from what it is now, they would have needed better engineers in those days of which history speaks not, than we have now, to make the water run up some of the mountains on the top of which they raised corn, wheat and other staples of life. And for miles and miles in many directions from these ruins, there are no evidences of water either present or past, and even to the present day tequila and mescal are the only liquids that play a very prominent part in many of the communities that exist by following the pursuit of husbandry.

Indian Dry Farmers.

"The Tarahumari Indians, of northern Chihuahua, said to be a remnant of the original band of prehistoric people of whom we have the first evidences of farming without irrigation, are among the most thriving of the aboriginal tribes of northern Mexico, and they till their soil by what we are today pleased to term 'scientific cultivation.' The Indian calls it common sense; some Americans call it dry farming. Call it what you will, it means getting out of the ground what nature intended us to get out of it, and the Indians are doing this most successfully.

Indians Seldom Fail.

"Dr. C. F. Z. Caracristi, a mining and civil engineer who has traveled over the entire world, and has of late been making some investigations among the Tarahumaris, declares that he never saw better crops in all his life than these Indians produce, and that they do it all merely by watching the seasons, knowing when to plant, how to plow—they used wooden plows—and just what to do on every occasion. They have not had any scientific men to teach them, but have learned from experience; they seldom have a crop failure, and the doctor says that they do their planting and working much after the same fashion as our scientific dry farmers of the present day. We have either copied from them or have studied out the same problem in the only way it is capable of solution.

Texas Begins to Experiment.

"In West Texas, while we are new at dry farming as actually practiced in that state, we are not new to it in that section of the country; we are the home of dry farming. The Indians nearby set the pace and we are merely following them—and with success, too. We are far less advanced in Texas in the matter of dry farming than in some of the states in the West simply because we did not have to resort to it and we didn't. We had so much land that didn't have to be irrigated or that had too much moisture as a general thing, that we have been busy with that. Now, however, we have discovered that the land we once scorned as fit only for a prairie dog and not fit for a respectable cactus, is as good as any in the state, and better than some.

Experimental Stations.

"Texas has awakened and the present Texas legislature is about to appropriate money for the establishment of three 'dry farm' demonstration stations in Texas, one of them at El Paso; the other two in the panhandle country, but hundreds of our West Texas farmers have already demonstrated what can be done.

"We now fully realize in Texas that the land in the West hitherto contemptuously referred to as desert, is in reality one of the greatest sections of the state; that it will grow nearly anything the wet lands of Texas will grow, and that for climate it surpasses all the rest. The atmosphere always clear and dry, the sky as blue as turquois, and the heavens at night like a canopy studded with diamonds, there is something to live for in the dry farming region that cannot be found anywhere else in the world. A man gets out of bed with a clear brain, an elastic step, wide awake and full of energy—the lack of humidity does it. That is typical of the dry farming region and it is healthful as well as productive. Many a man has come out west with a hole in his lung as big as his fist from bending over a plow year after year in a wet, sloppy, cold country, and now lives to thank Providence who created the dry farm and the blue heaven; the land of sunshine and health.

"It is not the soil that has brought many to the West in the past, but they have come in search of health, have found it, and necessity made them discover such wonders in the earth that the soil itself is now the attraction. A few years ago nobody came West to farm, unless there was something the matter with somebody in the family. Now if a man fails to come West we realize that there is something the matter at least with the head of the family, and most generally the trouble is with the head of the head of the family.

Immigration Increasing.

"The great western plains country is now the Mecca for hundreds of thousands of people annually and they are finding homes where they can live in peace. They are settling down on the vast expanse traversed in former years by the buffalo and the Indians and are making crops from soil that until recently was looked upon as unfit even for the burial of a dead Indian. This same soil is now yielding wheat, oats, corn, forage and all varieties, beans, pumpkins and other vegetables innumerable, and even watermelons. Yes, watermelons such as Georgia herself would be proud to produce, and on 10 inches and less of rainfall—it sounds to the skeptical like fairy talk, but is backed by the proof.

Crop Production.

"Providence did not create any of this land in the West to lie in idleness. It was made for men, and men have found it and are growing wealthy and happy and contented upon it. They are doing this by farming in a sensible manner—conserving the moisture that God gives them instead of wasting it—and they are getting results that would never have been dreamed of a few years ago, except among our uncivilized aboriginal brethren of northern Mexico.

"Land that will produce can be taken up for nothing. All a man has to do is to settle down upon it and live there for five years till Uncle Sam gives him a patent to it. Land that can be bought at from a dollar to three dollars an acre, is yielding astonishing results. All over west Texas and in eastern New Mexico—I refer to both as one, for there is nothing but an imaginary line dividing them, and the same conditions exist in both—there are millions of acres of land awaiting the coming of the homesteader, and every inch of it will produce some necessity. Where settlers have taken it up and farmed it sensibly, the returns are almost beyond belief, and they have not had anything to assist them but common sense and the natural rainfall. The man who did not use common sense, just like the same man in any other line, has failed, but the workers have obtained results. It depends on the man behind the plow and the brain he uses.

Dry Land Area.

Watermelons from Dry Land.

"From netting $100 an acre from watermelons grown on land that cost $5 an acre because it was alongside the railroad and adjoining a telegraph station and postoffice—land further from the railroad sells for much less—to harvesting beautiful crops of corn, beans, milo maize, sorghum and many other things, is the history of one dry farmer of my acquaintance in west Texas on the New Mexican line, and similar successful experience is the history of every dry farmer who has scientifically worked any of the land in my section of the country.

The Reeves Dry Farm.

"I have had occasion to make quite a study of the farm of J. F. Reeves, only twenty miles north of El Paso, in west Texas, situated on the El Paso & Southwestern Railroad at Newman, right on the border of Texas and New Mexico. He purchased his land from the Texas & Pacific Railroad, the land being a part of a grant made by the state of Texas when the road penetrated the 'Great American Desert' when there were no inhabitants and subsidies were necessary. He purchased this land at $5 an acre and the first year he planted about 70 acres in crops and not an acre was a failure. And it was his first year off a black land farm in Texas where it usually rained enough to float off his farming tools. On his dry farm he raised two acres of watermelons that averaged from 20 to 35 pounds in weight, and marketed them in October after the other Texas melons had disappeared from the market, and they netted him $100 an acre. His milo maize, kaffir corn, sorghum, Mexican brown beans, black-eyed peas, onions, pumpkins and other crops were as successful as his melons. The beans and peas grew as high as a man's knee, and the pods were long and well matured. The same can be said of the forage, and he was selling roasting ears in El Paso in October, when the rest of the state was shipping its shelled corn to the mill.

Precipitation Reports.

"And he did all of this on less than eight inches of rain! The winter was unusually dry, and he had almost given up hope when the spring also came without rain, for as a general thing that section of the country is blessed with some rain in spring, and the dry farmer can begin his planting then with the understanding and knowledge that there will be frequent showers in July and August. But this time Mr. Reeves got a bad start and yet made phenomenal record.

Results of Methodical Work.

"It was the second day of June, 1908, before sufficient rain fell upon the Reeves farm to enable him to begin his planting. Several heavy rains followed, and in the sandy clay-mixed soil, the seed came up and the young plants grew almost like Jack's bean stalk and shot heavenward under the bountiful downpour and the coaxing of the sun.

"On the first of September there came a frost, but the frost did not seem to damage the growing crops in the least. They seemed better able to stand it in that climate, for, instead of being killed, the stuff took on new life and thrived. When I visited the place on the 10th of October, the watermelons were just being taken to the cars for market, and although there had been two frosts, the milo maize, kaffir corn and Indian corn were still growing so fast I could almost see them moving upward. The sorghum had just been harvested, and a man six feet tall could not reach the tops of the shocks in the field. I took several photographs of Postmaster J. A. Smith, of El Paso, six feet tall, standing beside them as evidence of the height attained by the growth of dry farm sorghum in three months. He could not reach the top.

Windmills for Stock.

"While this modern farmer had windmills on his place for watering his cattle, and pumps water from a well about ninety feet deep—there is plenty of water at varying depths over most of this southwestern country—he had no means of pumping a drop onto his seventy acre field and every bit of the crop was raised with only the moisture that came down from heaven. Mr. Reeves told me that he had tried alfalfa, a crop that is known to require a great deal of water, and he also tried winter wheat, but his turkeys liked both crops too well to allow him to experiment successfully.

Cotton Experiment.

"He also sowed some cotton, for he loved the old weed that had been his principal product back in east Texas, 800 miles away—think of it, traveling that far in one state and still being 200 miles from the other border. (Texas is great.) We raise rice in the marshes on one side and watermelons without the use of water on the dry, so-called desert on the other side, while we raise oranges and bananas in the south along the coast, and cattle and sheep and icebergs and get the tail end of the harvest cyclones on the northern border.

"But his experiments with the cotton crop were not successful; the cold spell caught it just as it was blossoming and he says he will not lose any time experimenting with cotton again; but a couple of hundred miles east cotton grows well on dry farms. He is going to try wheat this year, and that he will meet with success is certain, for all along the same line of railroad through New Mexico, up past Alamogordo, Tularosa, Carrizozo, Tucumcari, Santa Rosa and other thriving settlements, the dry farmers who farmed right have been harvesting bountfiul crops of wheat, raising prize pumpkins, growing blue ribbon corn and beans on land of a similar nature, and without irrigation; they have demonstrated without doubt that the rainfall is sufficient. It is heavier up there than at El Paso.

Crop Varieties.

"And all they have to do to get this land is just to settle down on it, notify the nearest land office—and there is one at Tucumcari now—the United States had to create it last year because the other land offices in the territory had been swamped with the homestead applications—and go to work. In five years the government gives a deed to it.

Dry Land Homesteads.

Of the 23,000 homestead entries made during the last fifteen months in New Mexico, 20,000 are located in the so-called 'dry farming' districts of this territory.

Cheap Texas Land.

"West Texas is just as well off in the number of acres and quality of land available, but Texas makes her homesteaders pay for it—if you can call it paying for land that you can acquire at from a dollar an acre up to $3, with forty years to pay for it at three per cent interest. Most of the people who buy it find that after the first year they can sell out for enough to pay off their debts to the state and go back to the old home and have considerable spending money—but they don't sell—they don't want to go back home—they have found a newer and better one.

Experimental Stations.

"The United States government maintains demonstration farms at Amarillo and Dalhart, both in the 'dry farm' district. H. W. Campbell—some call him the father of the dry farming method—maintains a station at Midland, and the demonstrations have been most remarkable and have resulted in great good to the people. A recent test there made with an augur, showed moisture down to a depth of four feet—as far as the augur would reach—from within a few inches of the top, while a few yards distant over on the railroad righ of way, where the soil had not been cultivated in any manner, there was nothing but dry sand the full length of the augur. Over half a bale of cotton to the acre was raised at Midland this year by the Campbell system.

Campbell System.

"In Valentine Valley, west of El Paso, a little over a hundred miles, experiments have been carried on most successfully by private individuals; Mr. Campbell has offered to demonstrate that he can grow anything that is raised anywhere else in Texas in this locality just as successfully as it is grown elsewhere in the state, and they are arranging to give him a tract for a demonstration farm. H. L. Applegate has carried on some successful experiments in the Valentine Valley and, judging from the success he has had on small areas, he figures that the valley will easily accommodate 250,000 people and that it will yield annually $40,000,000 worth of products. He submits his figures on the basis of what he has accomplished on a small scale. He says:

Experiment Farms.

Results Estimated.

" 'Allowing one-half the valley land to be agricultural, we have about 750,000 acres of table land. Suppose that at some future time 200,000 acres of this land are planted in beans, 300,000 acres in sugar beets, 100,000 acres in wheat and 100,000 in oats or other forage crops while the other 50,000 acres are devoted to gardens, orchards, shade trees and public roads.

Beans.

" 'I will begin with the beans. It was shown last year that $45 worth of beans could be grown on one acre. Taking one-half that amount as a fair average crop for 200,000 acres of our best bean land, we have a yield of $4,500,000 Deducting $3 per acre as cost of harvesting and marketing, we have $3,900,000 for the growers, enough to support 3,900 families, or 19,500 people counting an average of five to the family and $1,000 cash to each family.

Sugar Beets.

" 'I will now figure on 300,000 acres in sugar beets. Beets can be grown successfully here. In the sugar producing states of the North an average yield of about twelve to fifteen tons to the acre is obtained and an average sugar content of twelve to fifteen per cent. Beets grown in the Valentine Valley last year showed a content ranging from sixteen to eighteen per cent sugar. Such beets sold in Michigan at the factories the two years I was there at $6 to $7 per ton, while the price paid for beets averaging between twelve to fifteen, was never lower than $4 per ton. Taking $5 per ton as a fair average, and twelve tons per acre as a fair average crop, we have $60 per acre. Allowing $10 per acre as the cash expense, and we have $50 an acre as profit to the farmer as pay for his labor. Three thousnd acres at this rate would net us $15,000,000 or 15,000 families, or 75,000 people supported in comfort. Counting ten tons of beet pulp to the acre and allowing a daily consumption of fifty pounds per head, the waste would be sufficient to feed 300,000 head of cattle the year around.

Wheat.

" 'We will pass on to the 100,000 acres of wheat. Allowing an average of twenty bushels per acre, and $1 per bushel profit on it and we have $2,000,000 and 10,000 more people provided for. Inasmuch as it is highly probable that wheat can be made to follow the bean crop the same season, 300,000 acres would thus be grown and three times as many people provided for.

Gardens and Fruits.

" 'From the 50,000 acres in gardens and fruits as much may be obtained as from any one of the other lines of agriculture touched upon in this letter. To sum up, we find that we can produce an income of $40,000,000 and support a population of 180,000 to 250,000 people in this valley in ease and comfort. It is my candid opinion that these estimates are conservative and that the actual results will in time far exceed the estimates I have made.'

Dry Farming a Success.

"Everywhere in the section of west Texas and New Mexico where the dry farming method has been applied it is a success, and the farmers are coming in daily by the score, picking out their homes and settling down, but there is room for millions more, and no doubt of the ability of the land to support them. 'Dry farming' has solved the question of what to do with the section marked out in the geographies as the Llano Estacado—and which the school children are taught to consider as a great desert. On much of that great 'desert' are thousands of the happiest homes in America, and land just as good waiting for the unborn thousands to come and claim it."

UTAH.

Mr. J. W. Paxman, of Nephi, Utah, addressed the convention as follows:

"Ladies and Gentlemen of the Convention—This session has already been prolonged, and I shall not detain you but a very few moments. I desire to say this on the part of Utah, that she is not making any great noise, but she is doing the thing proper. Most of you here remember the excellent convention that was held in Salt Lake City a year ago.

Value of the Congress.

The effects upon the people of Utah have remained and a new life and new activity have been found as the result of this Congress. And we would like to say to the people of this state that if as much good accrues to you as accrued to the people of Utah from the last convention, certainly some very great benefit will result.

Utah Has Different Conditions.

"In listening to the reports that are given to the representatives of the various states, I am lead to conclude that your conditions in the majority of cases are widely different to those that exist in Utah. It appears that of your annual precipitation, three-fourths of it comes during the growing months, while in Utah three-fourths comes in the winter months, and we have to study different methods in our state and in the inter-mountain country than what you do on the eastern slope. Perhaps our soil is of an entirely different character so it requires a different treatment from this standpoint. We find it a not very difficult thing to conserve the principal part of the moisture that falls upon our arid lands. If we will follow the methods given us by those who have had this matter in charge on the part of the agricultral college and other men who have been magnanimous enough to preach this good gospel among the people, we will feel pretty well fortified and qualified to plod along diligently with the soil and bring forth that which nature has in store. Because of this, Utah today feels secure in the matter of dry farming. She has for years past felt secure in irrigation, and I presume she is the leading state in the Union to adopt the methods of irrigation, and today, I have no doubt, stands at the head of any state in the Union in this matter. I believe the same can be said in regard to the dry farming movement. We have been dry farming, if it may be called dry farming, for upwards of thirty years, and we have in the

Work of Agricultural Colleges.

Irrigation in Utah.

Utah Was the Pioneer.

delegation today the honorable gentleman who some thirty years ago took this matter in hand and is properly called the pioneer dry farmer of Utah. I notice he is on the program for an address, and it may be your pleasure to hear a few words from him. He has passed his eightieth anniversary and consequently is getting along in years, but you will find him quite a youth when it comes to running races on the street.

No Fear of Failure.

"Because of the conditions prevailing in Utah, and because of the excellent educational advantages presented to us, we do not fear failure; in fact, failure is no frequent occurrence. Dry farming in our state is a success, and when I listen to the reports made here I am led to the conclusion that Utah is the proper place to go for successful dry farming. Utah has always had an eye that reached over the horizon and we have felt the impulse that moves you in the eastern states and on the eastern slopes of the Rocky Mountains. We have seen the trend of immigration coming westward and have endeavored to prepare ourselves for the day to come. In our own state generally it is passing that state and we are branching out in this new industry—new it was to most of the West, but in the greater portion of Utah it is becoming an old theme, and, as I said before, we are thoroughly established in the doctrine and in the industry and have accomplished some very excellent results.

Prejudice Still Exists.

"However, we are not without our doubting Thomases and were not in years gone by, and in my own county, in my own town a few years ago, there was a gentleman there who was actually indicted before a grand jury for giving testimony in court to the effect that he could grow crops on his land without artificial irrigation. I have a copy of that indictment here. He was tried before the federal court and a jury and finally, after great expense to him, was found innocent. Today I find with my samples some excellent peaches grown on the same land from peach trees from four to five years of age. The quality of this fruit cannot be beaten in the world. I have placed it on exhibition among the exhibits, and if any of you visit that place, I will ask you to have your attention drawn to the three bottles of peaches as proof that he did not testify falsely when he was brought before the jury.

Peaches From Dry Orchards.

Dry Land Area.

"We have in our state something over 20,000,000 acres of land now susceptible of cultivation lying idle. We have perhaps over one and a half million acres under cultivation, either by irrigation or by dry farming process, and after you have gotten through your waring and contentions in regard to the settlement and colonization of your country, send the rest of the good people across the mountains and we will try and take care of them properly. We will have enough educated among us so as to give them proper education so they will not meet with failure. I notice the program has two other numbers from Utah, so with these few items in regard to conditions in Utah, I will close."

WYOMING.

Hon. J. L. Baird, of Newcastle, who was to represent the state of Wyoming, being unable to be present, Mr. T. R. Wilson, of Uinta county, addressed the convention as follows:

"Mr. Chairman, Ladies and Gentlemen—I am very sorry that my fellow citizen, Mr. Baird, is unable to be here. He has been called to Washington unexpectedly, and as the time is now very far spent and as you doubtless are tired, I shall try to make my remarks very short. I will not attempt to deliver any desertation on the art of dry farming science at all, but I will confine myself simply to sentiment. In my younger years the only way men were able to produce plant growth was under the process of irrigation or by liberal rainfall. It was a very long time before we believed that plants could be grown with but little water, by soil treatment. Now as time has passed in the settlement of this great Union, we find that all the land susceptible to cultivation by natural rainfall has been absorbed by private ownership, and also that the land readily brought under irrigation has passed into private ownership.

Dry Land Area.

However, we now find a great deal of land, millions upon millions of acres that we are coming to know is susceptible of cultivation under scientific methods that have not been thought possible up to a few years ago. There has been a great divide existing between the two systems, and now it is for us, the irrigators on the one hand, the humid farmer on the other, to band together to cross this divide. The results of the deliberation of this great Congress, this representative Congress, are looked forward to with great anticipation. I wish to announce to those who may not know, that there have been gathered together from our

Dry Farm Exhibits.

experiment stations in Weston county, from our experiment stations in Laramie county, an exhibit that you are invited to go and view. If seeing is believing, you will all be convinced and made converts to the science of dry farming. Our past legislature has made an effort to control the liquor traffic; they have passed a law prohibiting the sale of liquor outside of incorporated towns and cities, and as we expect dry farming is to be conducted outside of towns and cities, it will be dry farming in more than one sense."

ORGANIZATION.

Mr. McColl (presiding)—"Mr. Burns desires to make an announcement."

Mr. Burns—"I want to impress upon all the delegates the importance of holding meetings of your delegations some time between this and 7:30 o'clock tonight. The reason for that may not be fully understood, therefore I will explain. At Salt Lake City we decided that an organization such as this should have its working officers in control of the convention proper, in order that the work and policy of the Congress might be well in hand. Therefore, the second Congress elected a permanent Executive Committee and permanent officers on the second day of the Congress. An amendment to the constitution was adopted giving such authority, those committeemen and officers to take immediate control of the working machinery of the Congress. It is therefore necessary that the delegations meet and elect a member for the Committee on Nominations and for the Committee on Resolutions. The Nomination Committee must make a final election report tomorrow morning at the open session. That report is final and fixes the officers for the year to come. Delegates will therefore please remember that these state meetings are imperative if states are to be represented in the permanent organization."

The Secretary then read the following telegrams:

"Boise, Idaho, February 23, 1909.

"Hon. B. B. Brooks, Cheyenne, Wyoming.

"I sincerely regret my inability to personally take part in the deliberations of The Dry Farming Congress. Please express to the delegates my appreciation of the great work the Congress is doing and say to them that I am ready and willing whenever possible to co-operate with them.

"JAMES H. BRADY, Governor."

"Salt Lake, Utah, February 22, 1909.

"John T. Burns, Secretary Board of Control, Trans-Missouri Dry Farming Congress, Cheyenne.

"Please convey to the Congress at a suitable time my profound regret at being unable because of my health and local duties to attend this session. Assure the delegates present of my increasing interest in the great economic movement they are met to advance, and express for me the sincere and earnest hope that their labors may result in the greatest possible good to Western agricultural interests.

"FISHER HARRIS, Executive Secretary."

"Spokane, Washington, Feb. 23, 1909.

"B. B. Brooks, President, Trans-Missouri Dry Farming Congress, Cheyenne.

"If you decide to bring the meeting of the Seventeenth National Irrigation Congress at Spokane, August 9th to 14th, 1909, to the attention of your Congress we would be pleased to have your delegates designate a representative to address the Irrigation Congress.

"INSINGER, Chairman Board of Control."

The convention adjourned until 7:15 p. m.

Third Session, Tuesday Evening.

F. C. Bowman, Chairman of the Executive Committee, presiding.

NAMING COMMITTEEMEN.

The Secretary announced the following selections by states for the Committee on Resolutions and the Committee on Nominations:

Resolutions—South Dakota, Samuel H. Lea; Kansas, Henry Block; Wyoming, W C. Deming; Idaho, J. McMillan; District of Columbia, E. C. Chilcott; Texas, G. A. Martin; New Mexico, J. D. Tinsley; Montana, J. A. McKinley; Nebraska, James Conklin, Jr.; Utah, Dr. John A. Widtsoe; Oklahoma, A. L. Mordt; Colorado, W. K. Winterhalter.

Nominations—Montana, P. B. Moss; Nebraska, A. P. Moore; Utah, T. F. Coombs: New Mexico, George A. Fleming; Texas, A. S. Hayes; Oklahoma, A. L. Mordt; Colorado, W. H. Olin; Kansas, I. L. Deesom; Wyoming, H. M. Bennett; District of Columbia, W. M. Jardine; Idaho, H. O. Harkness; South Dakota, Samuel H. Lea.

The Nominating Committee was called to meet Wednesday at 8 a. m.

UNION PACIFIC RAILWAY.

Mr. A. L. Mohler, vice-president and general manager of the Union Pacific Railway, addressed the Congress as follows:

"Mr. Chairman, Ladies and Gentlemen—Public speaking is not my business, but it gives me peculiar pleasure to be able to address this Dry Farming Convention. This is something very near to my heart. I believe in it, or I would not be here.

Dry Land Alfalfa.

"When I resided in Oregon, dry farming was a fad of mine and Secretary Wilson gave me a vast amount of support. We raised what we called 'dry farm alfalfa,' and if Oregon could accomplish today what we laid out for her, the state would be worth one hundred million dollars more than it is. Dry farming is a funny thing. You can't blow seed in with a bellows and you can't cultivate it with science, and you can't harvest it by legislative enactments; you really have to do business. We are in thorough sympathy with this enterprise, like everything else on our system. In America, the railroad system is standardized and everything is given careful thought. We have the American Association and everything is studied from a practical standpoint, and when you gentlemen erect a 'standard' dry farming, you will get very much better results. I was very much amused to hear the gentleman representing Oklahoma say that Canada was taking our immigration. Of course, if we had no Hepburn law we could help you. We would have an opportunity to bring people into the country and aid you, but as it is today

Railroads Interested.

our hands are tied—so absolutely tied that our reputation is like a roller-coaster, some days it is up and some days it is down. There is much, very much that could be said to this convention about dry farming development from the railroad man's viewpoint, but I am really not prepared to make a formal address tonight. This is a vital subject—it means vastly more than the delegates in this convention hall can conceive of. We railroad men are watching this movement with deep interest and are trying to work along intelligent lines with you. I consider this Cheyenne convention as fraught with more than local Western import—it is national and world-wide in its significance. Gentlemen, I thank you."

FOREIGN SECTION.

AUSTRALIA.

"Hon. James H. McColl, member of Parliament of Australia, addressed the Congress as follows:

"Mr. Chairman, Ladies and Gentlemen of The Trans-Missouri Dry Farming Congress—I felt kind of lonesome here tonight to think I was the only man from Australia, but a gentleman came up to me and said, 'I want to see you; I was born in Australia myself.' My word, I did shake his hand. To think I had gotten hold of someone who had gathered the gum and put his nose in the water blossom. I didn't feel lonely much after that. I have been a farmer there for twenty years in Australia, and if I were at home anywhere, I am at home in the gathering that is here tonight, and those whom I presided over this afternoon. I desire tonight to return thanks for the invitation received to attend this Congress, and thankful that I have been permitted to journey so far, some 12,000 miles, to be here.

Greetings from Australia.

"My first duty is to convey to this important gathering the Greetings of the thousands in Australia who are here in spirit if not in body, and who are watching this movement with anxious eyes because its success means so much to them. I desire also to convey to you, and through you to the people of the United States, the assurance of the kindly feeling that exists among all Australians for the people of this great Union, their kinsfolk across the sea. My next duty is to express my heartfelt gratitude for the warm welcome and feelings of brotherly kindness which have been manifested to me from his Excellency, the Governor of Wyoming, downwards, and how much I feel at home in Cheyenne.

"I have the privilege of being located with Mr. and Mrs. Gordon, who have been kindness itself, and Dr. Cooke has also spared no pains to make my visit pleasant and useful.

"This visit is of singular interest to me because of the community of feeling and interest between the United States and Australia. This feeling arises from various causes. First, because we are of one common origin, of one race, with the scarlet thread of kinship coursing through all our veins. Next, we have a common task—that of subduing a continent, of facing the stern conditions that would thwart our progress, and the need of bending them to our will. Further, because we, in the broadest sense over a common Faith and a common Master, and again, because we have a common desire to uplift humanity, to put away those things that degrade and enslave, and have the desire to condition ourselves in the highest circumstances of Humanity, Comfort, Progress and Peace.

Drouth is Common Enemy.

"Next, because we have a common enemy to face, the enemy of drouth, which tests our manhood, bars our progress, paralyses our energies and threatens to blight our future. And, further, we have other common problems to face, that I may not enter on here, for time does not permit—problems racial, social, industrial—all of these reasons inspire our people to work together for the good of our common humanity.

International Friendship.

"The great fleet that recently visited our shores with its sixteen battleships and sixteen thousand men, has inspired the warmest feelings toward your country in the hearts of Australians. They came not to destroy, but to help to fulfill, I believe, our united destiny; not to deal death and destruction, but as Messenger of Peace. We received them with open arms, and rendered such hospitality as their brief visit allowed. We took them to our hearts and homes because we found them men and gentlemen, who by their conduct, won our love and esteem. This week we rejoice to know that they return in safety, after one of the most memorable voyages in history, with their distinguished commander, Admiral Sperry, who has proved himself a sailor, a diplomat and a friend. They come sixteen thousand missionaires, to tell you of our land, and your brethren in the South. And so we strike hands across the sea and hold each other in a grip strong and true, to last while our nations endure.

"We learn much from the United States. It is the pace maker of the world. The pace may be too hot for us, for you have traveled very fast, but we are learning from you much to copy, some things to avoid. We work on slower lines and, I suppose, have some of the John Bull conservatism still in us, and perhaps it is as well and may save us some mistakes.

Dry Farming World Study.

"The problem we have come to discuss and try to solve is not merely local or state, or national, it is universal. It faces the people in nearly every land and today the nations are looking to see what this Congress can do to solve the common problem and fight the common enemy.

Aridity a Common Enemy.

"This American problem is the Australian one also, for aridity is the greatest foe we have to subdue. With us it turns wealth into poverty, plenty into scarcity, a fair promise into failure. It affects the rich and the poor, the farmer in the country, the laborer, and artisan in the city, and we do not know when its blighting hand may strike us. I do not think any trouble too great, any cost too high, to remove the uncertainty of our farm experience, and make the returns reasonably sure.

"Our country is as fair as any in God's creation, mild, selubrious, healthful, and we have a people as energetic as any. Show us how to combat this foe and so take the gambling element out of agriculture, for it is like betting on the clouds, and our prosperity will advance by leaps and bounds.

Area of Australia.

"The area of our country is about 1,900,000,000 acres, rather larger than the United States without Alaska, or practically three thousand million square miles. Of this, one-third is under a ten-inch rainfall. Another third has from ten to twenty inches, so you can see at once the importance of this dry farm proposition to us. No organized or united effort has been made in our country to improve our conditions in this respect.

Precipitation.

Campbell and Cooke.

"Here and there men who think deep and work hard have struck on improved methods and these methods are near akin to those of Prof. Campbell and Dr. Cooke. In my travels around, and I do a great deal, I find it is these men who have the best returns, are the most prosperous farmers, the envy of their neighbors, who say 'Isn't So and So a lucky beggar?' Ignoring the fact, that the success is due to energy, hard work and brains.

Australian Government.

"The short notice I received to attend the conference did not enable me to make many inquiries with regard to what the government was doing in dry farming in Australia, but I did receive the following letter from the Department of Agriculture in New South Wales, as to what was doing at Collabah:

"Department of Agriculture, Sydney, Jan. 12th, 1909.

"Sir: In reply to your letter of the 23rd ultimo, asking for the latest information in regard to dry farming, I have the honor to inform you that the results obtained at Collabah continue to be satisfactory.

Precipitation.

"Last year, with a rainfall during the growing period, of about six inches, the return from all the plots of 55 acres was 85 tons of cured hay. The returns from some of the plots was over two tons per acre. The rainfall in some cases was a little less than six inches, whilst the most that fell on any plot was six inches and twenty points.

Average Yields.

" 'The yield of grain, under the same conditions, ranged from practically a failure with some varieties, to 19 bushels per acre with the best.

Durum Wheats.

"It is interesting to note that the durum wheats have not proved as satisfactory under the conditions at Collabah as they have proved under semi-arid conditions in America.

Soil Treatment.

" 'The method of working is to have a summer fallow precede the wheat crop. The fallowed land is worked or cultivated with the peg tooth harrow, or with the disc cultivator, to conserve the moisture, to destroy weeds, and to obtain a good tilth. The seed is planted with a drill at the rate of 30 pounds per acre; after drilling in the seed the ground is rolled and then harrowed.

Seeding.

Crop Rotation.

" 'Provision is also made, by the rotation practised, to maintain the supply of organic matter in the soil so as to have it in the best possible condition to resist drought. The rotations which have proved the most suitable and practicable are: (1) Cowpeas, fallow, wheat; (2) Rape, fallow, wheat. Both rotations extend over three years.

Implements.

" 'The implements used to work the ground are: A four-furrow disc plough, a peg tooth harrow, and a one-way disc harrow or cultivator. This last named implement is really a skim disc plow, and is used like one; it has the advantage over the disc harrow in that it does not ridge the ground. It is, I believe, peculiar to Australians, and unknown in America. Any details concerning it which you may care to take over to America will probably prove of special interest. The sub-surface packer is not found necessary, as the cultivation which the fallowed land receives compacts the sub-surface thoroughly and effectively.

Sub-Surface Packer.

" 'If you desire it you can be supplied with small samples of the wheat, which has proved to be the best drouth resisters.

" 'I have the honor to be, sir, your obedient servant,

" 'C. C. ANDERSON.'

" 'Senator, the Honorable J. H. McColl, Quarry Hill, Bendigo, Vic.

"As showing the interest taken in our country, permit me to read two short letters. The first from the Honorable Alfred Deakin who, though not at present, has been Prime Minister of our commonwealth for the past six years, and who is the biggest man politically, in Australia.

" 'The Parliament of the Commonwealth, Parliament House,
Melborne, Jan. 13, 1909.

" 'My Dear Senator McColl:

" 'Allow me to congratulate you upon your public spirited resolution to attend the conference on dry farming, to which you have been invited from the United States. I am sure that your constituents throughout this state and, in fact, our agriculturists everywhere in Australia will watch your mission and benefit by it.

" 'When I visited America more than twenty years ago on a similar errand it was solely for the study of irrigation development in the West. Even then this was attracting general attention and has since established itself as the most fruitful field of experiment in the temperate zones of the world.

Investigations Helpful.

" 'You have already learned, as I did, how hospitable and generous our American friends are in laying their experience open to us. Your previous investigation of their new methods of cultivation with the lowest possible supplies of moisture, have already helped to put many of our farmers on the right road. Nothing could be more valuable to Australia than the knowledge the conference will collect. We want all we can get, and we need it now. Had I continued to hold the reins of government for two or three weeks longer you would have been appointed to represent the commonwealth at the conference in an official capacity and probably have been accompanied by one or two experienced farmers. As it is, you will represent us in fact, and your report will obtain as much publicity as if you had been formally nominated commissioner.

"With best wishes for the success of your tour, I am,

" 'Very truly yours

" 'ALFRED DEAKIN.'

"The other letter is from the Honorable W. T. Paget, Minister for Agriculture and Stock in the State of Queensland:

" 'Department of Agriculture and Stock, Brisbane, Jan. 18, 1909.

" 'Sirs: I have much pleasure in notifying you of the desire of this department that you will, when attending the Dry Soil conference, obtain for use here such literature and seeds that you may be able to secure, and that you will have the goodness to mention to the conference the interest that is being excited in Queensland concerning this system of cultivation introduced to Australia mainly through your endeavors.

" 'I have the honor to be, sir, your obedient servant,

" 'W. T. PAGET.'

" 'Senator J. H. McColl, Bendigo.' "

"Three years ago I was through here and met Mr. J. H. Gordon and Dr. Cooke. I found them as I find all Americans, no matter what their station, ready to pour out all he information they had. I only obtained a glimpse of what was doing in dry farming and since then I have tried to keep in touch with it and tell our people about it. Now I have come to note the gathered experience of the past three years, and I want to

Truth Should Be Known.

say this straight away, let us get to bed rock and have the actual facts and living truth. It will do no one any good to represent things as better than they are, and it would be a crime to make them appear worse. I have kept in touch so far as I could and have a mass of instances reported of the good work done. I want to see these verified. A careful persual of the proceedings of the Salt Lake conference left on me the impression that wittingly or unwittingly, in some cases the whole details were not told, especially in the matter of rainfall. The results were given, but not all of the particulars. Now, this question of precipitation is the very pith and essence of the whole matter.

"This week I find in the home of dry farming opinions somewhat mixed. There are many enthusiastic supporters. There are some unbelievers, and some doubting Thomases, willing to believe, but whose faith is as I heard a gentleman express it, 'In the twilight yet.' Of course, there are some men born doubting, and perhaps it is as well there are, for we are apt to receive too readily what we desire to believe.

"Let us stick to the Great Apostle's injunction, 'To prove all things and hold fast that which is good.' Personally, so far as I know, I am a believer, but I will be glad to have my faith further confirmed. I want what I know now made good, for I feel the responsibility of my position. I want to take a message to our people and it must be a true one. I want it to be a message of gladness, but on a good foundation, right on the bedrock.

"Let every man consider he is in the place where he is demanded of conscience to speak the truth, the whole truth, concealing and overstating nothing. Then shall we do glorious work, and to the end of the world the message will go, bringing honor to you, and glory to the land, that has started this great work for the good of the world at large.

Australia.

"I have been asked to talk of Australia, but time will not permit me to say much. It is a land geographically apart, the oldest country on the globe geographically, the youngest developmentally.

"In the working of the great designs of Providence this great land was reserved, as it seems, specially for the Anglo-Saxon race. Nations came and went, civilizations grew and decayed, yet away in the south this great silent land, one-fifth of the globe, was kept free from the disabilities of older lands, from their wars, their pests, their diseases, their physical drawbacks, kept a virgin country with but few inhabitants for the race most fitted to develop it.

"Kept as an outlet for the over-crowded nations of the old world, kept for the courageous and enterprising who desired to be free of their cramped environments, kept primarily for those of British blood, but open to all with whom the Anglo-Saxon can mix. Kept and to be kept as a white man's land. The term 'White Australia' is no more a political cry. It was first used by Sir Henry Parkes, Premier of New South Wales, who grasped the great ideal, and now it has sunk in the hearts of the people, with steadfast determination that we will keep our land from race demoralization, from those alien and inferior races who would lower our moral tone, our industrial conditions and would sooner or later give us a problem to deal with—the danger of which we may dimly forsee, but can not at present measure. For sooner or later the admission of a race of an inferior moral code, strained by sensual vices will create a cleft in society, that will shake it to its foundation.

"Therefore, at the loss perhaps of worldly wealth, of a more speedy development of our resources, we say to those races, 'We impose no head tax, we make no charge on your coming, but we bar you absolutely from entrance into Australia.'

"But to those races no matter from where they come, who can fulfill the same social and industrial conditions as ourselves whom we can take to our homes, with whom our children can safely associate, and later on intermarry, no matter from where you come, come and welcome, we receive you with open arms.

"We are permeated by an idealism, not so much to have a rich country, but a happy one, living in comfort and in peace. We desire to give an equality of opportunity and a square deal to every man. In all Australia I do not think you could find as many millionaires as you could count on your fingers.

"We have a land in which any product can grow. From which every mineral can be produced. We have raised gold to the value of 2,500,000,000 dollars, and today produce one-third of the world's yield. We have great coal formations, the northern coal beds of New South Wales alone covering an area of twenty-five thousand square miles, and are estimated to contain one thousand million tons. We have enormous bodies of iron ore, which we are just beginning to develop and a soil that for richness, all over the continent, cannot be surpassed. We want people, but we do not want them at any price, for we believe that in time the natural attractions and the industrial possibilities of the country, together with the high standing of social, industrial and political life we are seeking to maintain, will make our country an attraction to immigrants of the most desirable class.

Land Laws.

"Only about one-ninetieth of our land is alienated or subject to alienation. Our land laws are most liberal. Land can be had in various ways, by the fee simple, or by lease, and in areas sufficient to make a living on, raising from one hundred and sixty to two thousand five hundred acres —with right to get the free hold to many thousands of acres under leasing for long terms. The value of land from the government in fee simple, runs from two dollars and a half to five dollars per acre, and payments can be spread over from twenty to forty years.

"The Commonwealth has a political constitution the most democratic in the world, framed by men elected especially for the purpose by the people, revised by the people, and finally submitted to the people's judgment of adoption; the people's own choice from first to last. We have a frachise extended to every man and woman of good reputation and based entirely on their manhood and womanhood and not on their possessions. We have school systems in each state free, compulsory and secular, but with a high morality.

"Our public services, railways, postal, telegraph, telephones, water works, are owned by the people and managed by selected men free from political influences. Our works have all been carried out by white labor. In our Civil Service merit is the only passport to admission, and merit and senority combined brings promotion, and subject to the proper performances of duties each man or woman's position is absolutely secure to the retiring age.

Irrigation in Australia.

"We have enormous possibilities of irrigatiton when we can get our works constructed, our waters conserved, and our schemes developed. And while we have to face aridity, it is not so bad as some may think, for we have good seasons as well as bad in these arid and semi-arid parts, and the recuperative properties of our land are such as are not equalled anywhere in the world.

"We hope to get lessons from you, both precept and example, to help us to overcome our one drawback.

"We have followed you in your Fiscal Policy and not our Mother land. And you can not complain if we take your methods of industrial development and treat you as you treat us. Our brother is nearer us than our uncle, even if that uncle be Uncle Sam.

"But, gentlemen, I did not come here to talk especially of Australia. I am not an immigration agent, but being asked to take up this theme I have given you an idea of our people, our country, and our aspirations, to which I thank you for listening. Let us apply ourselves to the work before us, and setting an example of business-like dealing evoke from this Congress a theory and practice, that will cover our arid places with happy homes, wrought by brave, self-reliant men, with contented wives by their sides, and laughing children at their knees.

"And the word of the Seer of Old will come true to us, 'The wilderness and the solitary places shall rejoice and blossom as the rose. It shall blossom abundantly and rejoice even with joy and singing. The glory of Lebanan shall be given unto it, the excellency of Carmel and Sharon, they shall see the glory of the Lord, and the Excellency of our God." '

CHEERS FOR AUSTRALIA.

Mr. Kent of Wyoming: "We gave the gentleman from Brazil the courtesy of three cheers and I think we ought to give Australia the same courtesy."

Mr. Bowman (presiding): "Gentlemen of the convention, please arise and give three cheers for Australia. (This was done with a will.) Gentlemen of the convention, I have the pleasure to presnt the gavel to our president, Governor Brooks, of Wyoming."

The secretary then real the following telegram:

"Washington, D. C., Feb. 23, 1909.

Government Co-operation.

"Hon. B. B. Brooks, President Trans-Missouri Dry Farming
Congress, Cheyenne, Wyoming.

"Please extend to the members of the Trans-Missouri Dry Farming Congress best wishes for success of its third annual meeting. Department of Agriculture stands ready to co-operate in every proper way. It offers help in its work on the introduction and improvement of crops for dry land conditions, extension of knowledge regarding conservation of soil moisture, improvement of cultural methods, in short, in everything that may aid and encourage the home builders.

"JAMES WILSON."

BRAZIL.

Lawrence Baeta-Neves, special delegate from Brazil, adderssed the Congress as follows:

"Your Excellency, Governor of Wyoming, and President of this Congress, Mr. Chairman, Honorable Members of the Third Trans-Missouri Dry Farming Congress, Ladies and Gentlemen:

"In the invitation that came to me through the courtesy of Mr. John T. Burns, your secretary, to attend the Congress, this gentleman asked me to tell you something about the necessities and possibilities along the line of dry farming in Brazil. And to respond to this additional compliment which he paid me, I beg for a few minutes of your attention.

Brazil Interested.

"Brazil is not indifferent to the solution of the problem that is discussed in this meeting. If it was not for the interest that is awakening in all the world in this system of cultivatiton, that permits the increase of the living resources on the earth, getting from the desert land, room for the homes of new generations, Brazil would still have sufficient reason to think on it. We have a semi-dry region which must become prosperous and not lie perpetually unproductive.

Dry Land Area.

"In our immense area about 250,000 square miles greater than the United States proper, there is one northern part, near the Atlantic coast and below the Amazonic basin, where the drouth comes almost periodically, bringing serious troubles to the lives of many thousands of Brazilians who live there.

"This part of the country, though being small in comparison with the total surface of Brazil, is considerable in area, containing lands of great fertility, lacking only moisture to be productive. Any light rain transforms it, covering the land with green vegetation in a very few days. With moisture everything grows there. Such lands are not more than 2,000 to 2,400 feet in average, above the sea level, on the mountains, and the dominant rocks are gneiss.

"You know that we have no snow or ice in Brazil, and certainly we cannot have them n that land which I speak about lying a few degrees below the equatorial line and not being a high part. Its dryest part is between something like 2 degrees, 5 minutes and 7 degrees south latitude, in the state of Ceata. Therefore, the moisture to render the

Precipitation Irregular.

soil productive only comes from the rain, but this, notwithstanding being enough for the desired productiveness, if we consider its annual average, about twenty-five inches in the dryest time), does not produce the expected result, because of its extraordinary irregularity, combined with great evaporation noted there. Sometimes the rain stops for many months, coming only in a very few days during the year.

Irrigation.

"There, as you do here, the Brazilian government is carrying on irrigation, but certain parts of such lands must be considered in a different way, because of the difficulty or impossibility of getting water enough for irrigation purposes. For that reason the Brazilian govern-

Government Co-operation.

ment wishes to try the dry farming process. And as I spoke about it before the Sixteenth National Irrigation Congress, Brazilian General and State Governments are interested in the Campbell system, and experi-

Campbell System.

ments with it have been ordered in some places in order to establish Dry Farming in semi-arid zones of the country. Such a process results so well in your country, when properly applied, that it will be of a great importance to us, principally in the northern states, if we can apply it successfully.

"Besides, in a very few years the dry farming process will also be of necessity for other zones, where the cutting of the forest is changing the regularity of rains and causing diminishing of the sources.

Bi-ennial Cropping.

"But in the Brazilian semi-arid zone it is necessary to prevent the trouble that is brought to the process by an excessive rainfall, that sometimes comes at once, while pass months and months without a drop of rain. If such a thing can be done, if we can get something along this line, I think the dry farming will be of successful application in the semi-arid zone of Brazil, provided that we adopt the system of bi-ennial or tri-ennial crops, to prevent the lack of sufficient rainfall in the years of excessive drought like those we had some time ago.

Summer Fallow.

"In such a manner lands to be cultivated must be divided into two or three portions, each of which holding two or three years moisture for one good crop. One-half or one-third of the lands must be put in crops each year, while the other one-half or two-thirds portions will be keeping moisture by being summer fallowed. Thus the land will become productive. But a little more than this is yet necessary for the permanent establishment of the system, that will be more lasting.

Modern Home Life.

"It is necessary that the farmer may find around himself some comfort for the complete happiness of his home. It is necessary that in the excess of sunshine he may find some comfortable shade near his home given by the trees, which will render the temperature of the air more agreeable. In addition to this there should be some fruit trees and a small vegetable garden.

Pumping Systems.

"To get all of this our soil even in the semi-dry lands is not lacking in the fertility, and we have sufficient underground water for irrigatition of limited areas ,that can be easily pumped from wells by wind mills or other more convenient machinery, the water being stored in a reservoir with sufficient capacity to regulate the irrigation.

Wind Mills Necessary.

"Even without such consideraiton that to many people would seem of little importance in dry climates, the wells are a great necessity to supply water for the household and stock purposes, avoiding the hard work of obtaining water some times miles and miles from the farm.

"From what I know by my own observation of the dry lands in my country, combined with the lessons that I have learned in the great West of America, I really do not know if we can do better by another way along the line of dry farming. This is my humble opinion, but certainly I give it to you with my highest appreciation of your great experience with this so important subject, in which I am scarcely yet initiated.

"As an engineer I have been working principally in water ways, and I am especially interested in irrigation systems, but, besides this, I am investigating dry farming processes.

Dry Farming and Irrigation.

"This must be the compliment of irrigation, for notwithstanding being entirely different in appearance both are similar in their results, consisting of two different ways of getting the same thing—moisture for the plants.

"In order to take the most advantageous profit from the irrigation systems in dry lands, the water which remains in the irrigated field should be used without great expense for dry farming purposes, in limited areas for orchards, etc. This being located below that field, down stream, even in lands a little higher than the first one. In this case the water may be stored and pumped.

"Thinking in such a manner, I used to study irrigation, observing at the same time something along the dry farming line which was a special order from the last president of my state in Brazil, one of the men who recently brought about many improvements in my country. He revolutionized the state of Minas Geraes from the primitive methods of cultivation and established scientific agriculture, introducing there the most advantageous systems of treating the soil. Unhappily for us Brazilians, this exceptional man died four months ago, when by the whole country he was spontaneously called to be candidate for the presidency for the next term of the Republic of Brazil.

Revolution in Farming.

Brazilian Student of Dry Farming.

"The name of this man is Joao Pinheiro da Silva, whose memory we Brazilians love, as you do the memory of your greatest men. It must be known by this Congress as that of the Brazilian who in an official capacity was interested most in the dry farming process, principally because this meeting is the first one attended by a Brazilian. Joao Pinheiro da Silva was one of the greatest of all Brazilians in our time, one of the founders of our republic, and one of its best statesmen.

"He knew that the greatest benefactor of a country is the man who makes the soil productive, and among other important problems of his most excellent administration, he realized entirely the agricultural transformation of his state. His value was too great to be confined within the boundary of my country. By his death in the history of Brazil a new page is opened from which, when his work will have been written, will irradiate light strong enough to shine beyond the frontier of my country, and he will be known wherever the history of America would be studied without regional prejudice, when the flags of American countries will form together a large flag of peace and fraternity, which will wave over all parts of the Western hemisphere, testifying to the world the complete victory of the Monroe Doctrine.

Dry Farming in Brazil.

"Dry farming if successfully applied would be the best thing we could get for northern Brazil, below the Amazonic basin, that can offer to the farmer the most favorable conditions of climate and fertility of land, just as the largest part of my country, where it is always delightful to live.

"Brazil, in the largest portion of its territory is a country endowed by nature in every particular way, and our resources are now securing more recognition from the world, while the foreigners turn to us their eyes, attracted by our rapid development and extraordinary progress. They, surprised at our civilization, begin to study us more carefully.

Immigration Into Brazil.

"In a very few years our population, now so little in comparison with the great area of the country, something like 22,000,000 of inhabitants, will be increased by several millions of foreign people, who are going to live with us, assured of the success of what they shall find in Brazil.

"Mr. John Barrett ,one of the most distinguished American diplomats, director of the International Bureau of the American Republic, at Washington, describing the opportunities of my country for legitimate exploitation of North America's capital, said: 'The simple fact that Brazil covers a greater area than the United States proper; that out of the Amazon river every day flows three or four times more water than out of the Mississippi; that the city of Rio Janeiro, its capital, has now a population of 800,000 (we have one million or a little more—L. B. N.), and spent more money last year for public improvements than any city of the United States, excepting New York; and that today the central government and the different states are spending larger sums for harbor and river improvements than the government or states of the United States, all convince the skeptical that Brazil is a field for the investor to study thoroughly and thoughtfully.'

"The International Bureau of the American Republic gives every month one of the best publications, full of interesting and valuable information, with fine illustrations, descriptions, and official figures from reports of all American republics. This bulletin is an excellent source of study of all the Amercan countries maintained by the bureau to promote commerce and trade, and develop among the republics of the western hemisphere a better acquaintance, for certainly, from this acquaintance will come 'closer relations and more intimate intercourse along material, educational, intellectual and social lines.'

"The same distinguished American in his interesting article under the title, 'The Land of Tomorrow,' made true statements regarding my country, principally in regard to Rio de Janeiro, the federal capital of Brazil, that he considers growing as fast as Boston, St. Louis or Baltimore, and that today is one of the most interesting national countries of civilization, industry, art, literature and education in the world.

"Rio really is an advanced town, worthy of serious study, where the old civilization has much to learn, but our progress is not concentrated in Rio. All over the country it will be noticed.

"And it was because he was surprised at such progress that Mr. Elihu Root paid a very nice compliment to us, counseling all North Americans to think a little more of Brazil, advising them to go to South America instead of spending their valuable time in Europe.

Brazilian Progress.

"Brazil grows fast in every line, and the federal and state governments do all they can to promote such a result. If in any way an improvement is considered necessary, we do not delay in stating it, and almost always, in a few months all things are ready.

"In the last few years we have began and finished in Brazil permanent work that in many most advanced countries would take years and years to be done. To prove what I say I can show you some illustrations of permanent works, truly monuments of art done in months by Brazilian engineers.

"A country that thus takes care of its progress, daily advancing in civilization, cannot be indifferent to the solution of a problem like dry farming, that is of vital importance to its future. It cannot leave unproductive, eternally dry and crackling under the excessive sunshine, one of the most beautiful and fertile parts of the national territory, and sooner or later there will be seen the fruits from the lesson of this Congress, for whose attention I must thank you very much."

CHEERS FOR BRAZIL.

A delegate from Texas: "I move you the delegate from Brazil be given three cheers:" (Three cheers were duly given.)

SOUTH AFRICA.

Governor Brooks introduced William Macdonald, M. S. Agr., Ph. D., F. R. S. E. Editor, Agricultural Journal and Dry Land Agronomist of the Transvaal Department of Agriculture, who addressed the Congress as follows:

"Mr. President:

"With your permission, I shall read three messages, which I have the honor to lay before this Congress:

"The first is from General, the Right Hon. Louis Botha, P. C., M. L. A., Prime Minister of the Transvaal and Minister of Agriculture:"

Greeting From Transvaal.

" 'South African National Convention, Cape Town, Jan. 13, 1909.

"To the Delegates of the Trans-Missouri Dry Farming Congress.

" 'Gentlemen: I have instructed Dr. William Macdonald to convey to you on behalf of the government of the Transvaal our most cordial good wishes for the success of your Congress, and to assure you that the people of the Transvaal will follow your deliberations with much interest.

" 'The scientific study and utilizatiton of the dry lands are subjects of the highest importance to the whole of South Africa and the great advances which have been made in the United States of America have encouraged us to hope that the same results may be obtained in South Africa.

"'Believe me, gentlemen, yours sincerely,
"'LOUIS BOTHA, Prime Minister of the Transvaal
and Minister of Agriculture.'"

"The second message I have been requested to convey to you is from His Excellency, the Earl of Selborne, P. C.; Governor of the Transvaal and High Commissioner for South Africa:"

"'High Commissioner's Train, De Aar, Jan. 12, 1909.

"'Dear Dr. Macdonald: I think we have every reason to feel gratified for the kindness and courtesy of the Secretary of the Department of State in inviting the British Colonies in South Africa to take part in the Dry Farming Congress, which is to take place at Cheyenne at the end of February next, and for the great care which has evidently been taken by the board of control to make this Congress a success. You will be able to tell the gentlemen who receive you how much this courtesy is appreciated in South Africa, and what great importance we attach to the success of this Congress, for dry farming is a scientific problem which it is as much to the interests of South Africa to solve as of the United States of America.

"'Wishing you all success, believe me, yours very truly,
"'SELBORNE, Governor of the Transvaal and High
Commissioner for South Africa.

"The third message which I have been commissioned to lay before you is from the Right Hon. the Earl of Crewe, P. C., M. A., Secretary of State for the Colonies, Sir. Francis Hopwood, K. C. B., Under-Secretary of State for the Colonies, writes as follows:".

Greeting From England.

"'Colonial Office, Whitehall, London, Feb. 9, 1909.
"'Dr. William Macdonald, Langham Hotel, London.

"'Sir: I am requested by the Secretary of State for the Colonies to ask you to convey to the President and Members of the Trans-Missouri Dry Farming Congress, which meets at Cheyenne, his most cordial good wishes for the success of their deliberations. Lord Crewe desires me to add, that he has followed with keen interest the splendid progress which has been made in the reclamation and settlement of the arid lands of Western America; and he is confident that the scientific study of the potentialities of those regions in which the rainfall is small and irregular will do much to promote the agricultural prosperity, both of the United States and the British Empire.

"'I have the honor to be, sir, your obedient servant.
"'FRANCIS J. HOPWOOD,
Under-Secretary of State for the Colonies.

' "Lastly, I am desired by His Excellency, the British Ambassador, at Washington, the Right Honorable James Bryce, O. M., P. C., to convey to you his best wishes for the success of this Conference and to assure you of the great interest he takes in the agricultural development of Western America.' "

Area of Transvaal.

"The Transvaal, of which I wish to speak today, is one of the eleven Provinces which make up the various States and Protectorates of British South Africa. In size it is, roughly, 112,000 square miles, or in other words, 71,680,000 acres. It is, therefore, the same size as the state of Arizona. The last census, 1904, tells us that there are in the colony only some 300,000 Europeans with over one million natives. It is thus plain that the country is still very sparsely peopled, a fact that will be better realized when I state that whereas the average size of a farm in the Transvaal is about 5,000 acres; in the United States it is 143, and in England, 66. The Transvaal, as is widely known, is immensely rich in mineral wealth. The gold output for the past year was valued at $150,000,000, which is nearly twice that of the United States and represents one-third part of the total production of the whole world. Moreover, a short distance from Pretoria is the Premier Diamond mine, where the famous Cullinan Diamond was recently found. Besides gold and diamonds the Transvaal possesses large deposits of coal, tin, copper and many other metals. But great as our mineral resources, they are small in comparison to the agricultural potentialities of this wonderful state.

Large Farms in Transvaal.

Crop Variety.

"The Transvaal varies in altitude from 1,500 to over 7,000 feet above sea level, and in these different agricultural zones it is possible to grow cereals of all sorts, sorghums and fodder crops, tropical and temperate fruits, tobacco, cotton and coffee, fibre plants and bananas; and at the same time, to raise cattle and sheep, horses, ostriches and angora goats. It will, therefore, be seen that the Transvaal is eminently a land for the agriculturist and stock farmer, with a range of climate and culture equal to, if not surpassing, either California or Florida.

Agricultural Possibilities.

"These brief notes will suffice to show that this colony has a great agricultural future and I am glad to say that our farmers are co-operating in a splendid manner with the Department of Agriculture—under the able direction of Mr. F. B. Smith—to develop our great naural resources in a sound and scientific manner. For many years past it has been urged—and justly so—that the great need of South Africa is irrigation. So much, however, has this point been pressed that until quite recently the vast possibilities of our dry lands have been entirely ignored.

Irrigation.

Dry Land Valuable.

This, to my mind, is utterly wrong, and I do not hesitate to say that, in my opinion, the dry lands of the Transvaal, if cultivated on scientific lines, are not only of the highest value to the individual farmer, but are a priceless heritage to the state.

American Idea.

"It would take me too long were I to speak in detail of the history of the dry-farming movement, brief as it has been in the Transvaal. I may remark, however, that our inspiration came directly from the state of Utah. Well, the result has been that the government of the Transvaal has recently started, under the Department of Agriculture, a Dry-Land Experiment Station, close to the town of Lichtenburg in the western part of the Transvaal. So far as I am aware, this station is the first to be established in the British Empire for the express purpose of investigating this particular branch of agricultural science.

Experiment Station.

Precipitation Report.

"Let us turn to the rainfall. When we consider the annual precipitation of this colony it may appear fairly high if viewed from a strictly Dry-Farming standpoint. At the same time it must be remembered that no snow falls in the Transvaal as is the case in Wyoming and other parts of America. Again, it is not so much from lack of rain that we suffer in the Transvaal, as from its irregular distribution—a matter which I shall make clear a little later. In those valuable reports which are annually issued by Mr. R. T. A. Innes, the director of Meteorology for the Transvaal, we find that last year (1907-1908) the lowest rainfall was 13 inches at Bloemhof, the highest 43 in the Wood Brush forest, with an average precipitation for the whole year of 23.25 inches. Furthermore, in surveying the precipitation data from individual stations we note that whereas Schweizer Reneke in the Bloemhof district had only 17 inches in the season of 1906-1907; the Wood Brush Forest in the Zoutpansberg district in the Northern Transvaal had a rainfall of 117 inches. I need hardly remark that we do not propose to attempt dry-farming in this portion of the colony.

Precipitation Uncertain.

"I now wish to touch on the uneven distribution of our rainfall. Turning again to the Meteorological Report, we find that 26.12 inches fell at the Government Forest Station; and now remembering that the season in the Transvaal is the reverse of that of Wyoming and the Great Plains region, we observe that during, what we may broadly call our winter and spring months, viz., May, June, July, August, September and October, only 2.12 inches fell during the whole six months; whereas in the next six months or during our summer and autumn, viz., in November, December, January, February, March and April, 24 inches fell. Now the practical significance of this matter is plain, when we remember that our staple cereal—maize—is planted from September until December. In a word, if no rain falls in September, which sometimes happens in the Lichtenburg and other districts, farmers cannot plough their land or plant their maize unless their fields have been previously

Soil Treatment.

tilled and the soil moisture conserved. I am, therefore, convinced that the methods so successfully adopted by the Utah farmers, and so ardently advocated by Widtsoe, Merrill and Jardine, namely, deep ploughing, constant cultivation, combined with the moisture-saving fallow will also be found to be the best means for the Transvaal farmer to insure his crops against seasons of drought.

Evaporation.

"Side by side with the rainfall should be studied the great problem of evaporation. The iluminating paper read by Dr. L. G. Briggs of the Department of Agriculture at your last Congress ,is worthy of the attention of every farmer. As you may remember, Dr. Briggs' investigations show that at two points, namely, in North Dakota and at Amarillo, Texas, the annual precipitation was practically the same, during the year under review. Whereas the rate of evaporation at the Texas station was almost twice that in North Dakota. I am certain that the rate of evaporation on the dry lands of the Transvaal is likewise very great; and this is a problem which calls for immediate investigation. In South Africa it is widely believed that our seasons are drier than those of 10, 20 or 30 years ago. But the data compiled by Professor Chilcott and Dr. Briggs relative to the rainfall of the past 30 years on the Great Plains area, showing that the difference of precipitation over decennial periods was actually only one-half inch, leads me to think that the same may also be true of our seasons in the Transvaal. But I must not trouble you with unnecessary details; and in passing from the subject of rainfall,

Land of Sunshine.

I would mention that as a land of sunshine the Transvaal is probably without a rival in the whole world. From maps prepared by the Director of Meteorology and published in the Transvaal Agricultural Journal we learn that whereas last year in the Transvaal there were 3,330 hours of sunshine, Monte Carlo in the South of France having only 2,500 hours and England but 1,600. The Transvaal, therefore, is entitled to be called 'The Land of Eternal Sunshine,' and this is probably the chief reason why all crops in a well tilled, moist soil, germinate and shoot to the surface with such surprising rapidity.

Soil Conditions.

"Let us now look at the soil. To a hurried traveller, viewing mile after mile of waving rooi (red) grass, it might appear that the Transvaal was more adapted to cattle ranching than to agricultural farming, an opinion that has been advanced by more than one authority within the past few years. This, however, is an error, which is becoming more evident every day. Neverless, chemical analyses seem to indicate that compared to the soils of Europe, the Transvaal lands are poor in the essential elements of fertility. Notwithstanding this, in favorable seasons the fields of the Transvaal produce abundantly, and we reap, when the locusts are busy in the other Colonies, rich harvests of all kinds of crops. What then is the explanation? In a series of interesting researches, Mr. R. D. Watt* of the Transvaal Department of Agriculture has shown that, although our soils are lacking in humus or vegetable matter, not only are nitrifying bacteria present in abundance, but they are found in a state of great activity. He further concludes that in a semi-tropical country like the Transvaal, nitrification proceeds much more rapidly than in a more temperate land, such as England, with the consequent rapid disappearance of organic matter—in the form of plant and animal remains—from the soil. These experiments are fully corroborated by the fact that many of our sandy soils, which on analysis are found to be very poor in nitrogen, are yet capable of producing excellent crops. Further, it might be supposed that our long, dry winter would have an injurious effect on these organisms, but Watt found the nitrogen germs present in a fairly active state even at the very end of our dry winter. The practical lesson from these experiments is very plain.

Soil Treatment.

"The Transvaal farmer must strive to promote the action of these beneficial soil germs by tillage, manuring, and liming. More important to my mind, however, than either the chemical of biological factors, at least so far as dry farming is concerned, is depth of soil. And I unhesitatingly support the view advanced many years ago by that eminent

Hilgard on Soils.

scientist, Professor Hilgard, of California, as to the great value of depth of soil in relation to the water-holding capacity of semi-arid lands. Hilgard has shown that the low humus content in the soil of arid regions is more than balanced by the high nitrogen-percentage which renders nitrification more rapid. He writes, 'It thus appears that on the average the humus of the arid soils contains about three and one-half as much nitrogen as that of the humid.' **And again, 'An additional consideration is the probable greater ease with which the nitrifying bacteria can act upon a material so rich in nitrogen. We must not, then, be mislead by the smallness of many humus-percentages in the arid region, into an assumption of a deficiency in the supply of soil-nitrogen.'

Effect of Soils.

"In the Transvaal, in our dry districts, a casual examination will reveal two widely different types of land. The one may be characterized as a shallow, sandy soil, one to three feet in depth, resting upon gravel or rock; whilst the other is a deep uniform, sandy loam, of from ten to thirty feet in depth. It need hardly be said that the latter ground—the deep loam—will remain practically unaffected in dry weather, under ordinary circumstances, whilst plants in the shallow soil are wilting, parched and dying.

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*Transvaal Agricultural Journal, Vol., No. 26, Page 202.

**Soils, by E. W. Hilgard, page 138.

Dry Land Corn.

"And now a word in regard to the crops which we grow on the dry lands of the Transvaal. The most important is maize, (or the corn of the United States) which is locally known as the mealie. There is no part of South Africa, from Cape Town to the Zambesi and beyond, a distance of over 2,000 miles, which is not adapted to the growth of this cereal. Recently, the government under General Botha, has made a vigorous and successful effort to promote a maize export trade, and there is little doubt that every year will see larger and larger quantities shipped to London.

"The London price is about ten shillings per bag of 200 lbs., which means about seven-eights of a shilling for the grower in the Transvaal.

Stock Fattening.

"Besides shipping the grain, a great deal of ensilage is now being made and fed to cattle and sheep. The great advantage of growing maize in the Transvaal is that it is possible to harvest it during the dry winter season, consequently it does not get damp or mouldy in the field, and so can be shipped in first-class condition for the English markets. After maize in importance, but before it as a drouth resister, comes our

Kaffir Corn.

famous kaffir corn, of which the white and red varieties are commonly grown. Then of late, dry-land lucerne—the alfalfa of the West—has been

Alfalfa.

successfully grown, mainly through the efforts of the Government Botanist, Mr. Joseph Burtt-Davy, for sometime connected with the University of California, and to whose splendid energy we owe so much in the Transvaal. Mr. Burtt-Davy's work in the twin field of Economic Botany and

Seed Breeding.

Plant Breeding, has resulted in giving us not only a great number of valuable plants and seeds from other countries, but also several new varieties of maize.

Hay Grasses.

"The Teff-grass, introduced from Abyssinia by him, is now widely grown by our High-Velt farmers and has proved an excellent hay grass. In order to escape the ravages of rust, it is customary to grow wheat under irrigation during the winter months; but we hope by more scientific methods to grow this cereal also successfully during the same season on our dry lands. Many of our fruits, too, except the Citrus varities are grown on dry lands chiefly, owing to the practical demonstra tion by the Government Horticulturist, Mr. R. A. Davis, an expert of wide experience, both in California and Cape Colony.

"Finally, I wish to speak very briefly regarding some remarkable results which have been attained by steam cultivation in dry land farming in the Transvaal. I refer to the work of Messrs. John Fowler & Co., Ltd. Leeds, the well known firm of English agricultural engineers. This firm has made a specialty of steam plowing machinery since the year 1850, during which period they have supplied plows for steam cultivation all over the world. Furthemore, it is not without interest to remember that the uncle of the present head of the firm, was the inventor of the famous Balance Plow. Apart from the purely commercial aspect of the business, it is probable that Messrs. Fowler contemplate with most pleasure the imperishable pioneering work which has been done by them in the agricultural development in the more remote regions of the British Empire. Following up their usual custom, they sent a representative to South Africa, six years ago, and started a demonstration farm at Vereeniging, under the control of Mr. W. A. McLaren, M. I. C. E. an engineer who has had a life long experience in agricultural operations in relation to steam cultivation in different parts of the world. Here I may say that it was never the intention of Messrs. Fowler to establish what is commonly known as an experimental farm; but merely to grow the staple crop of the country, which is maize, on a large scale, and at the same time to demonstrate how profitably it could be produced by steam cultivation. These tillage operations are carried on by steam plowing tackle, or what is commonly termed Fowler's Patent Double Engine System, which has been in vogue since the year 1852. The advantages of the Double Engine System over what is known as the Direct System, my be summed up as follows: (1) The engines do not travel over the fields, but move along the headlands. (2) The whole effort of the engine goes direct into the work of the plow, whereas, it has been estimated that quite three-fifths of the power given off by the direct traction engine is required to propel itself. (3) With the Double Engine System the land can be tilled much sooner after rain than by the direct Traction system.

Steam Plowing.

Demonstration Farm.

Deep Plowing.

"In South Africa, where the deep stirring of the land has found to be so essential for the maximum conservation of soil moisture, the double engine system has invariably given better results than the direct Traction system.

English Machinery.

"The plowing tackle consists of two cables 450 yards in length, a five-furrow balance plow, and a packer weighing about two tons. This packer was invented by the firm about fifteen years ago, and has proved a very valuable implement for securing a mellow seed bed. The planting is done by means of a combined implement consisting of a 24 tine cultivator, a consolidator, the planting coulters, and a harrow hung on behind; the four operations being done simultaneously by this machine which cultivates, packs, seeds and harrows sixty acres per day. The amount of land that a steam plow turns over, is from fifteen to twenty acres per day, or usually from 2,500 to 3,500 acres per annum, according to the number of days it's at work, and the nature and condition of the soil. In the Transvaal, with steam tackle, it is possible to plow practically every day in the year.

Soil Treatment.

"The soil of Vereeniging is a fair, average quality, and varies from a stiff clay to a light, sandy loam, and the amazing thing is, that in spite of the severe drouth of the past five years, the Vereeniging crops have not only never failed, but have shown an increased yield every season without the use of manure. This result, McLaren attributes to deep plowing, thorough tillage, and the use of moisture-saving fallows. The value of those fallow lands was shown in a striking way last season when the maize harvest ended, on August 26th, and planting for the new crop started the very next day, or about one month ahead of the usual time of seeding. The final result of these operations may be summed up in a single sentence.

Summer Fallow.

Results of Methodical Work.

"McLaren has conclusively demonstrated that, under ordinary conditions, the dry lands of the Transvaal, cultivated in a scientific manner, with double engine system of steam tackle, in the hands of skilled workmen, will successfully produce large crops of maize in seasons of the severest drouth. He is therefore entitled to be ranked as the pioneer dry-land farmer of South Africa.

"And now, in closing this paper, already too long, I desire to thank you for your kind reception. I have journeyed over twelve thousand miles by land and sea, to be present at this great Congress. And, although I am a citizen of another country, I am no stranger within your gates. For, as a lad, I have lived and toiled with you on the prairies of the West, and I am a student of two of your universities. It is not, however, for any personal merit that you welcome me here to-day, but rather because I bear you greetings from the youngest of states and the oldest of empires. Because I am bidden by the Prime Minister of the Transvaal and by his Excellency, the Governor, to convey to you their warm appreciation of the lasting work which has been accomplished by the various representatives of the American people in the mineral and agricultural development of South Africa; and because I am requested by the Secretary of State for Colonies, and by the British Ambassador to express to you their personal interest, on behalf of the Imperial Government, in the important work in which you are now engaged. The Dutch and

English people have ever been pioneers on both land and sea. And in British Africa, at least, the page of history is still wet with the writing of their splendid daring. For if, on the other hand, the Voortrekkers, in search of new homes, have carried forward civilization from Table Mountain to the turbid water of the Limpopo; the English explorers have crossed the trackless waters of the Soudan, till they reached the eternal snows of Ruwenzori. To you, therefore, pioneers of the new West, I bring you greetings from the pioneers of British Africa. Gentlemen, I count it a signal honor to have been permitted to address this Congress, for I am assured that your deliberations will do much, not only to advance the material welfare of that great region which reaches from the Missouri to the Golden Gate, but will promote those lofty ideals of true liberty, friendship and humanity, which have ever been the flashlights of this great Republic."

CHEERS FOR TRANSVAAL.

GOVERNOR BROOKS (presiding): "Three cheers for Dr. Macdonald from the youngest state of the oldest empire.

(Three cheers were given Dr. Macdonald.)

CANADA.

W. H. Fairfield, representing the Department of Agriculture of the Dominion of Canada.

Address to Congress:

"It gives me great pleasure to have the privilege of addressing this assembly. Canada could not afford to miss the opportunity of profiting by what you people can teach us, as was realized by our Minister of Agriculture, and Dr. William Saunders, the Director of Experimental Farms, for the Dominion. Of course we have to acknowledge that there is no part of Canada quite so dry as certain parts of the states—at least in the matter of rainfall. I don't want to judge the climate by any remarks as far as aridity is concerned.

"From the way some people talk, down here, I infer that you think we Canadians are within hailing distance of the North Pole. You are rather disappointed that our representative is not a fur-clad Esquimaux, and are wondering in your hospitable souls, whether we would prefer whale blubber or caribou steak for dinner, and you politely conceal your skepticism about our soil being thawed out long enough in the year to do dry or any other kind of farming.

"Now to speak for Canada, is a pretty big order. You know that we occupy more on the map than the States, and there is considerable room without considering the portion supposed to be fit only for fur-bearing animals and eternal snows—though even that, as the Englishman said about the buckwheat cakes, is not 'half so nasty as it looks.'

"I am going to speak, however, about a comparatively small part, which comprises an area that lies immediately east of the Rocky Mountains or of the British Columbia boundary, extending east some six hundred miles and north from the boundary about three hundred miles. As to climate, there is room for considerable variety in this area. Last

Climatic Conditions in Alberta.

week, we had in Souther Alberta, (which is locally known as the Bonana Belt) a couple of days, where the themometer went up to 62 above zero. Up north of Edmonton, it does not get quite so warm in the winter, and we sometimes get a dip too far the wrong side of zero for comfort, but it does not last. I may as well confess right here, that we don't raise bananas in Southern Alberta, but up at Fort Vermillion, some 350 miles north of Edmonton, Alberta, which is again about 300 miles north of Lethbridge, (my home in Southern Alberta) they have raised tomatoes.

Canadian Crops.

Here in the immediate vicinity of Fort Vermillion, on the Peace River in Northern Alberta, 35,000 bushels of good wheat was raised last season, besides oats and barley. So you see, we are raising wheat as much farther north of the international boundry, as is Springfield, Illinois, north of New Orleans.

"Now as to what we are doing in dry farming: In the southern portion of this area I have defined, it was considered for a number of years that the rainfall was too light to allow general farming to be carried on

Experimental Stations.

successfully. Some 20 years ago, the Dominion Department of Agriculture established an experimental farm in the eastern part of Saskatchewan. Mr. Macay, the superintendent of this farm, found that there was sufficient rainfall to produce two crops in three years, and his method of culture is as follows:

Biennial Cropping.

"The land is plowed in May or June, which, by the way, is our wet season, and clean summer tillage is practiced for the rest of the season, wheat is sown early the following spring. This crop is cut high, so there

Save the Snow.

will be plenty of stubble left to catch all the snow possible. In the spring all this stubble is burned off, and wheat, and occasionally oats is sown immediately on the land without plowing After this crop is taken off, the land is again summer fallowed The rainfall at Indian Head is 15

Precipitation.

inches. At the time the experimental farm was established, the settlers were becoming so discouraged, that they were moving out, much the same, as was the case in western Colorado, and western Nebraska and Kansas in the early 90's. This same locality has the distinction now of being one of the heaviest country wheat shipping points on the Canadian Railway system. Farther west, in the country lying east of the Rocky Mountains, or in Southern Alberta, the rainfall is slightly less, and the country was considered good only for stock raising.

Transforming the Range.

"Eight or nine years ago, some large irrigation enterprises were inaugurated, and shortly after this, it was discovered that the district was peculiarly adapted to the raising of winter wheat. An enterprising American brought in a car of Turkey Red Wheat, from Nebraska six years ago. This was the first hard winter wheat raised in Western Canada on a commercial scale. From this beginning six years ago, the industry has grown till the past season, when we thrashed over four million bushels of hard winter wheat. The average yield for the Province of Alberta of this wheat, is put by the government at twenty-five and one-half bushels per acre.

Turkey Red Wheat.

Yield Per Acre.

"I visited personally, scores of individual fields this past summer, that yielded fifty bushels and upward to the acre. I can site one field of over ninety acres that yielded sixty-three bushels to the acre. In quality, our wheat is very high—to grade No. 1, it must weigh sixty-two pounds to the bushel. In attending a large number of seed fairs, I found that there was not a single exhibit of Turkey Red wheat, or as it is locally known, 'Alberta Red,' that weighed as low as sixty-two pounds to the bushel and there were many that weighed sixty-six and sixty-seven pounds to the bushel.

Quality of Dry Grains.

"Naturally in Southern Alberta, where winter wheat thrives, yielding better than spring wheat, it has been substituted in place of the latter. Although the rainfall in Southern Alberta is not much different from Southern Saskatchewan, the other climate conditions are different, and it has not yet been determined whether we have sufficient moisture to raise two crops in three years, or whether it would be better to expect only one crop in two years. Recognizing the need of investigation along these lines, the Dominion Department of Agriculture, has established two experimental farms in the province of Alberta.

Experimental Stations.

"Besides raising winter wheat and spring grain, we have raised alfalfa, 300 miles north of the international boundary.

Sugar Beets.

"We are raising sugar beets commercially. There is a sugar-beet factory, which has been successfully operated for the last five seasons at Raymond, Alberta.

Irrigation.

"There has been inaugurated, some very extensive irrigation systems within the last few years. The largest is the one put in by the Canadian Pacific Railway, which will irrigate 3,000,000 acres in one tract.

Summer Tillage

"Irrigated lands at the present time are being discounted somewhat, by the phenomenal yields of the winter wheat. As it has to be sown in August, it is ncessary to give the land a careful summer tillage, and this fact is responsible in a great measure for these large yields.

"So much for our crops, although there is a great deal more that could be said that might be of interest to you. I do not feel inclined to take up any more of your valuable time for we came to listen and not to talk, but before sitting down, I want to say just one word as to the sort of farmers, who are filling up this couuntry of ours, and on whom, we have to depend to develope the agricultural resources of our western prairie province.

"There are a good lot of Ontario farmers, sturdy English and Scotch-Irish stock, whom I need not describe to you as there are thousands of them all through the states. Then there are representatives from every state in the Union, those west of the Mississippi contributing most freely. There are also in some sections, representatives from most of the Northern European nations, and of course Englishmen. On the whole, as you see, just such a population as you would find in any western state. In fact, it is hard to tell which side of the line we are on, so far as the population is concerned, and altho' we are all proud of our grand new country, with all its possibilities of growth and its immense future, we have a mighty warm feeling in our hearts for our cousins across the line. So far as unity of race, education, character and ideals are concerned, we are one people. Why the only way you can tell whether you are visiting an American or a Canadian family, up our way, is that one gives you coffee for breakfast, the other, tea."

CHEERS FOR CANADA.

A DELEGATE: Three cheers for Canada.

(Three cheers were given for Canada.)

TURKEY.

The following letter from John Henry House, president of the Thessalonica Agriculture Institute at Salonica, was read:

"Salonica, Turkey, January 13, 1909.

"Mr. John T. Burns, Secretary Board of Control, Trans-Missouri Dry Farming Congress, Cheyenne, Wyoming.

"Dear Sir—Your favor of November 18, 1909, was duly received and greatly appreciated. The following statement of the conditions under which we are working here in Southern Macedonia may be of some interest to the Congress.

Macedonian Conditions.

"Our farm of about 53 acres lies about 2½ to 3 miles to the south east of the city of Salonica, the old Thessalonica of St. Paul's time. That name was given it, I believe, by Alexander the Great in honor of his sister, who was married to one of his generals. Alexander's birthplace was some 25 miles to the west of the city, and the birthplace of Aristotle was about the same distance to the east. So we are on historic ground. And if climatic conditions were the same in those days, we have had a long line of predecessors to battle with semi-arid conditions which have at least pervailed here for the last two years.

Crude Farm Implements.

"Agricultural conditions are seemingly much the same in the primitiveness of the implements used that they were in the time of Abraham The same brush-handled sharp-pointed shovel plow scratches the ground, and the brush-wood harrow levels it. The farmers congregate in villages and often times are obliged to travel miles to reach their fields. They would be afraid to live on their farm fields as we do. Often times their village dwelling places would hardly be considered fit barns for our stock.

Macedonian Farmers.

"The farmer and farming is looked down upon because of the untoward condition under which he lives, and quite often he is obliged to borrow money, (or rather the grain which makes their bread) of the usurer at 50 per cent to 200 per cent interest, in order to get over from harvest to harvest, thus mortgaging the future harvest for the winter's supply of bread for the family. So you see that in many parts of Macedonia, and for that matter, of the whole country, the conditions of the tillers of the soil are pitiable in the extreme and the best of all callings has fallen into the greatest disrepute.

Uplift for farmers.

"It was this sad condition of the farmers and their children that has led us to establish an agricultural and Industrial school here which has for its object the teaching of not only the heart and the head, but also the hand. We believe that the farmers of America will be interested in our efforts to uplift the farmers of Macedonia. Our institution is an American institution, incorporated under the laws of the state of New York. I myself however, am from Ohio, and received my first lessons in farming in that state. The conditions in Ohio, however, I found were far different from the conditions here.

Precipitation.

"On October 30, 1907, I began meteorological observations and from October 29, 1907, to October 29, 1908, I found the rainfall to be 12.34 inches, the largest portions of which fell from November 1 to April 3. The amount which fell in that time was 9.32 3-4 inches and from April 3, to November 4, was only 3.01½ inches. These observations seemed to me to bring this region which lies to the south of the Rhodope range of mountains in the Balkan Peninsula largely into the regions which are called semi-arid.

Dry Farming is Salvation.

"The Dry Farming system, which has of late been practiced in the Great Plains of our semi-arid West, had already attracted my attention and we have begun trying those methods here. Of course we are only in the beginning and without large experience and doubtless will make many mistakes, but we are believers in the kind of culture thus used and already have begun to see that they are really practicable here. We feel greatly encouraged about the possibility of raising good crops of wheat, barley and oats here, but we feel more doubtful as to our succcess in fruit growing, but are determined to make the trial.

Mulberry Trees.

"We have about five acres of mulberry trees for silk culture growing, and some of them are in excellent shape and promise well We are now the possessors of a disc harrow and with it we hope to be able to conserve the moisture in these groves and are inclined also to try other fruits.

Grapes.

"Not only can wheat, barley and oats be raised here, but the region largely abounds in vineyards and grapes of a very fine quality are raised. It is what I have found here among our village vinedressers which I wish especially to report to the Congress. These villagers are the finest vinedressers that I have ever come across. While they seem to me to be very indifferent farmers in other respects, they seem from their fathers before them to have by experience hit upon what I call the dry-farming methods, with reference to their vineyards, and they have little by little turned almost all their attention to grape growing, which has thus become by all odds their most profitable industry.

Soil Treatment.

"Their method is to take a field and by hand dig it up to the depth of about two feet with an instrument which they call a "dexil"—the form which I roughly indicate here. A couch grass, or wire-grass as I sometimes call it is most persistent here, and no drouth ever seems to kill it out, but by this digging up the grouund foot by foot with this instrument, they not only open up a deep soil for the roots of the vines, but eradicate the couch grass by throwing out every piece upon the surface of the ground where it is allowed to dry up. After the vines are set out, they are continually digging over the ground with the same instrument by hand labor, and especially after every rain.

Kill the Weeds.

"Not a weed is tolerated and the endeavor is to keep the ground always mellow and dug over. The vines are cut back to the stub near the ground every year, and are not trained upon trollises. I wish the members of the Congress could visit us during the grape ripening season. These vineyards, extending almost as far as the eye reaches, loaded with luscious fruit, are indeed a pleasant sight. So far as the government records are correct and enables us to get the amount of acreage, the vineyards of our village called "Kapudjeelari" which lies to the south east of the city in the direction of Cassandra, cover some 960 acres.

American Machinery.

"While we can hardly be said to have more than got a fair start upon the dry-farming methods upon our small school farm, yet we find the fine American machinery—the sulky plow, the disc-harrow and the seed drill (we have the "Empire) of the greatest help in working up the soil along scientific methods, and one of our fields, which with harrow and plow has been worked over some nine or ten times while in the fallow and in preparing for seeding, is now, at the time of writing, probably the finest looking grain field in all this region. Of course it would not do to prophesy as to the harvest, but our experience on one of our barley fields last year, whose yield, (26 bushels to the acre) was not large, yet was quite remarkable beside other fields near by, which were hardly worth reaping, this experience, I say, encourages us to hope that we shall eventually succeed in being of some help in bringing the agricultural conditions into a somewhat better state in this region. I am sending you under another cover, a few of my last year's reports, which perhaps some members of the Congress may like to glance over. The report for 1908 is not yet ready.

Result of Methodical Work.

"With my best greetings to the Congress, in which I feel honored in being a member, I am, sir,

"Very sincerely yours,

JOHN HENRY HOUSE.

"President of the Thessalonica Agricultural Institute, Salonica, Turkey."

RUSSIA.

(By Joseph A. Rosen, Special Delegate from the Department of Agriculture of Russia.)

"Ladies and Gentlemen, Members of the Dry Farming Congress—I consider myself fortunate in having been given an opportunity to express to you the great admiration our people in general, and our foremost agriculturists in particular, have for the remarkable energy and extraordinary ability to accomplish things displayed by the Western farmer of this great counry of yours. The best of them, the creators of the West, are among you, among the members of the Dry Farming Congress.

Dry Land Area.

"We, Russians, are especially interested in your work as there are vast regions in our country similar to your semi-arid and arid West. Our steppes in Southern European Russia closely resemble your Great Plain region. Our Turkestan and a large part of our Middle Asia possessions are in many respects similar to your Great Basin region and the arid portions of California and Arizona.

Russia Watching America.

"We are confronted by the same problems which you are trying to attack and are watching your progress with great interest. I know there are at the very moment, men in the various portions of our country impatiently waiting for reports of these meetings and who are more anxious 'to learn and to wait,' than many a man in your own midst.

"But we would not like to be in a position of one who only TAKES, we are anxious and willing to GIVE, be it only a single drop contributed to the sea of science and human welfare. Nature has been lavish with us. In a crude, unsystematic, but perhaps surer way, than by artificial means, she has herself selected for us a good many kinds of plants adapted to semi-arid conditions. We are immensely glad to see you drawing upon this stock. I can hardly tell you what pleasure it gives me to see in your fields our native 'Kubankas,' 'Gharnovkas,' etc., etc. They sing a song of brotherhood of men.

"We also have a good many experimenters, whose investigations, I am sure, would prove of interest to you. I may have an opportuunity to relate to you at some other time the resuls of this work. The principles and methods of Dry Farming are not new to us. We have had among us a good number of inquisitive minds that have developed the same ideas and have reached the same conclusions as your apostles of New Agriculture. What we lack mostly it that charmingly attractive vim, push, that WILL TO LIVE, TO ACT, AND TO ACCOMPLISH, which so distinctly marks the American, especially the American from the 'Wild West.' among other people in this rather sluggish world of ours. We find inspiration in your activity and I, therefore, ask you to accept the heartiest congratulations and best wishes from your friends from behind the seas."

Adjourned to 9:30, Wednesday morning.

Fourth Session, Wednesday Morning.

The Congress resumed its deliberations at 9:15 a. m. Senator J. H. McColl, of Australia, presiding.

ELECTION OF OFFICERS.

MR. P. B. MOSS OF MONTANA. "The committee on nominations reports:

"President, Edwin L. Norris, governor of Montana.

"First Vice President, John A. Widtsoe, president Agricultural College, Logan, Utah.

"Second Vice President, D. D. Hoskins, Las Vegas, New Mexico.

"Third Vice President, Professor Walter H. Olin, Fort Collins, Colo.

"Members of the Executive Committe: Samuel H. Lea, state engineer, Pierre, South Dakota. A. P. More, Brule Nebraska. Dr. G. R. Hickok Syracuse, Kansas. Anders L. Mordt, Guymon, Oklahoma. G. A. Martin, El Paso, Texas. J. D. Tinsley, Agriculural College, New Mexico. C. R. Root, Denver, Colorado Martin H. Hartung, Cheyenne, Wyoming. Alfred Atkinson, Bozeman, Montana. F. C. Bowman, Idaho Falls, Idaho. J. W. Paxman, Nephi, Utah. George J. McCabe, Palmerlee, Arizona. Dr. R. W. Thatcher, Pullman, Washington. W. J. Keer, Corvallis, Washington. Arthur R. Briggs, San Francisco, California. Richard A. Riepe, Ely, Nevada. Dr. Lyman J. Briggs, U. S. Department of Agriculture, district of Columbia. J. H. Shepherd, Fargo, North Dakota."

Report Adopted.

The report of the Committee was adopted by unanimous vote.

Foreign Vice Presidents.

The following resolution, presented by F. C. Bowman of Idaho, was read by the Secretary:

"Resolved, that each foreign nation represented in this Congress be entitled to one Honorary Vice President."

The rules were suspended and the resolution adopted.

The following vice presidents were named:

Alberta, Canada, George Harcourt, deputy minister of agriculture, Saskatchewan, Canada.

W. J. Rutherford, deputy commissioner of agriculture.

Russia, J. H. Rosen.

Mexico, Senor Don Romulo Escobar.

Australia, James H. McColl.

South Africa, Dr. William Macdonald.

Brazil, Lawrence Baeta-Neves.

Upon motion ballot was proceeded with and the nominees were declared elected.

Experimental Directors.

Mr. McColl (presiding): "We will now listen to a number of reports of the progress being made at state experimental stations and agricultural colleges."

COLORADO.

Professor H. M. Bainer, professor of farm mechanics of the Colorado Agricultural College, addressed the convention as follows:

"Gentlemen of the Congress: In giving the report from Colorado I fear that there are others better prepared to give this report than I am. Professor Olin, who is in the Congress at the present time, has been the Agronomist during the past years and so far as breeding work in grains, forage crops, etc., is concerned, Professor Olin is better prepared to give that than I.

Field Co-Operation.

"I will say that our experiment station has done some co-operative work with the farmers of the state in conducting dry farming experiments. We are located in an irrigation district at Fort Collins. We do not have very much dry farming in the immediate vicinity of Fort Collins, and the station does not farm any dry farm land. The land is practically all under ditch, except a small piece of pasture land.

Farm Machinery.

"We have been doing some work in the line of farm machinery, and I like to talk about farm machinery, because I am at the head of the farm machinery department at the college. We do some work toward securing the best dry farming machinery, and in fact all kinds of machinery used in irrigation and dry farming districts. We have secured quite a number of valuable tools.

Machinery Exhibits.

"You will find some of those tools represented in the machinery exhibit here at the present Congress. There is a good display of implements and tools adapted to dry farming conditions and irrigation conditions. I think it is only fair to make it a point to visit these exhibits and to look over, and encourage these machinery men in making bigger and better exhibits another year. So far as the machinery we are trying to experiment with at the Colorado Agricultural College is concerned, I will say that we have done considerable work with the disc and moldboard plows, and also with some of the new implements such as the renovator for alfalfa.

Alfalfa Renovator.

This device is for fixing up the ground after the harrows. That is, it is a common smoothing harrow for making good seed bed.

Disc Plow.

"We find the disc plow used a great deal in dry farming conditions, especially where the ground is hard and dry and it is impossible to keep the mold board plow in the ground. We can plow with the disc plow and the disc pulls easier and penetrates the grouund somewhat better, but yet at the same time I cannot recommend that plow to plow as good as does the moldboard.

Moldboard Plow

"Take it under conditions where the ground contains enough moisture for plowing and you will find the mold board does the best work. We find a great many of our farmers don't know how to adjust their disc plows to make them work properly, and that is one of the main troubles.

Gang Disc.

"We find that this plow is self-sharpening to a cerain extent, and does not require as much repair, as much fixing up in the way of sharpening. I know one farmer who reports that with an engine gang plow he has been able to plow 2400 acres without sharpening his disc. That is a lot of ground to plow without sharpening your disc. With a mold board plow, if you plowed that much you would have to sharpen your plow half a dozen times or more.

Alfalfa Renovator.

"The alfalfa renovator that I talked about is made on the principle of a disc harrow with the spikes in place in a solid plate. That is a new tool and I believe it is a coming tool for not only pulverizing the soil in grain growing conditions, but also for work in alfalfa.

Soil Treatment.

"It was originally made for the culture of alfalfa crops, and was made with the idea of pressing the ground down and at the same time opening it up so that the air can get in and not let the moisture out. It is also a good weed killer. You can see that on exhibition with the John Deere exhibit.

Pulverizing Soil.

"They have also a fine harrow that I think is going to be one of the best known implements for pulverizing the soil.

Weed Killer.

"This is a common ordinary tooth harrow with another tooth in the form of a blade which kills the weeds by cutting them off, and raking them off at the same time, it making a good dust mulch. It comes highly recommended. It has been used a great deal in Oregon and the farmers there recommend it very highly. We find the tool known as a weeder is a weeder only when used at the proper time and that is before the weeds come up, and it isn't properly made unless you use it before the weeds come up. The tool is lightly constructed and made with the idea of getting over a whole lot of ground, and it does fairly good work as long as the soil does not become baked or hard and provided you get on the ground early. I don't believe I want to take up any more of your time, unless you have some questions you would like to ask regarding machinery."

DISCUSSION.

MR. CURTIS, of Kansas: "I would like to ask regarding the difference between the disc and mold board plows, if you don't get better plowing, plowing with the mold board?"

Moldboard vs. Disc.

MR. BAINER: "Yes sir, you do. North Dakota a few years ago conducted experiments. In one case they used disc plows and in another the mold board and continued the plowing year after year, and the report was that the field plowed with the mold board brought better crops year after year while the other naturally went back.

Soil Treatment.

A DELEGATE FROM MONTANA: "Do you think that when the ground is too dry to plow with the mold board that it is beneficial to plow with the disc?"

Fall Wheat.

MR. BAINER: "I don't think it is beneficial to plow any ground when it is too dry, but at times for instance when you want to put in fall wheat the last of August and the ground is too dry to plow, and you must necessarily get so much ground plowed, but in order to plow it you will have to use a disc, because you can keep the other plow in the ground.

Disc Drills.

"In regard to disc drills, I recommend whenever the question is asked me about whether or not to use the press wheel attachment, I recommend its use. There are conditions where you don't need it, but if I were buying a drill today I would buy one with the press wheel attachment, so that I could take it off if I didn't need it, but you will find ordinarily that you will need that attachment."

Soil Treatment.

A DELEGATE FROM MONTANA: "This wheel presses the soil down around the grain?"

MR. BAINER: "Yes, sir."

A DELEGATE: "Won't that aid the moisture in coming out?"

Surface Packing.

MR. BAINER: "It aids the moisture in coming in contact with the seed; it does'nt leave the ground open around the seed, but you understand with the surface packed on top, there is more chance for the moisture to get to the seed. With the press wheel attachment, the packing is over the grain right where you want it and there is not much danger from moisture being lost."

Soil Packing.

A DELEGATE: "I find that it opens a very narrow slice in the wet ground below and your seed takes root in this wet ground and after the dry spells come on they are not rooted and are stricken down."

Press Drill.

MR. BAINER: "We had a great deal of trouble in Colorado with grain not coming up uniformly and we found where the press drill was used the grain came up better, owing to the fact that the moisture was packed around the seed right where it was wanted.

Soil Treatment.

"If you leave the ground open there is every chance for the air and wind to take the moisture out from the root of the seed and before you get enough moisture to make the seed grow well, it dies."

Seed Drill.

A DELEGATE: "I find the seed drill gives better results."

MR. BAINER: "Maybe under certain conditions it will, but under average conditions it will not. Of course, this pre-supposes that the ground is in ideal condition when you use the drill.

Soil Treatment.

Of course, you cultivate the ground the season before and the mulch is on top and you drill the grain into a very narrow opening which closes the hole that the shoe drill makes. That has given splendid results for me, but it is so often that ground is not in that condition. You know packing does tend to bring the moisture up to a certain extent. Any moisture down deep in the ground will naturally be drawn by packing. That is so with the crust and unless you break the crust on a field you will lose a lot of moisture."

Sub-Surface Packing.

MR. HAYES, OF TEXAS: "I would like some information as to the method of packing the ground after plowing."

MR. BAINER: "Well, there are two different methods commonly used. One is the Campbell sub-surface packer which is advocated so much at present by dry farming people. With that method you pack under the surface and at the same time leave the upper surfac practically loose. The other is by means of some type of bore either corrugated or smooth. If I used either one I would use the corrugated bore which has 'V' shaped wings. That leaves the ground rough over the surface, ridges and depressions lying side by side from the top of one ridge to another, being from two to four inches. In case it is windy, which sometimes bothers a great deal, by running that corrugated bore over you can save blowing to some extent. There is some danger of losing moisture because the surface is smooth on the surface where the packer wheel is worked."

A DELEGATE: "I want to know, does not the sub-surface packer make that packed condition more thorough?"

Sub-Surface Packing.

MR. BAINER: "It certainly packs under the surface better than the corrugated roller. Because it is made with a narrow rim there isn't as much tearing up of the surface."

A DELEGATE: "Does not the sub-surface packer leave that condition that you want with the mulch loose on top?"

MR. BAINER: "It does."

A DELEGATE: "Now does that not check the loss by wind you referred to?"

MR. BAINER: "It does to a certain extent, but I don't think you can expect much out of it in the way of checking the wind."

A DELEGATE: "Does not much depend on the direction in which the packer is run with reference to the prevailing wind?"

MR. BAINER: "Yes, it does; you should make it nearly at right angles with the prevailing wind if possible."

Gumbo Soils.

MR. HALE, OF SOUTH DAKOTA: "I would like to ask the gentleman whether he ever experimented any in heavy gumbo soil, such as we have lying between the Black Hills and Missouri river? Whether he ever experimented enough to advise that we use a sub-surface packer? Our soil is very heavy, the heaviest I ever plowed in and I have plowed from Pennsylvania to South Dakota."

MR. BAINER: "I am not able to answer that question."

Sub-Surface Packer.

PROF. JARDINE: "It seems to me the sub-surface packer is misunderstood by a great many farmers over the country just as much as the roller is misunderstood. We probably all admit that the roller at certain times of the year when used with proper discrimination and discretion is a good implement, but by no means would we get up in a convention like this and recommend its universal use. I consider—and my judgment is based on a good deal of experience—that the roller placed in the hands of an ordinary farmer is as much of an enemy to dry farming as is the packer.

Surface Roller.

Damage By Wrong Use of Implements.

"Time and time again I have visited farms over this dry area when the farmer has been driving a packer immediately after the plow. In plowing our land or farm on an extensive scale, it isn't always possible to plow exactly at the right time; hence, we are turning over the soil in too moist a condition and also in too dry a condition. I have seen sub-surface packers balled up with mud, made so by dragging over the soil in too moist a condition. Such treatment of the soil will do more damage once than can be recovered in several years of tillage thereafter.

Sub-Surface Packer.

"I think with knowledge of the sub-surface packer—and the way it is being advertised without regard to its use, is certainly an enemy to dry farming today.

Summer Fallow.

"I do not see its place in dry farming, where summer fallow is practiced on the soil that can be considered too heavy for the sub-surface packer. With summer tillage the disc will compact that soil sufficiently. We have not got the data yet that will warrant the statement that the sub-surface packer can be recommended to farmers.

Sub-Surface Packing.

"I have seen fields practically ruined from using this at the time when it never should have been placed on the land. We all admit that loose soil can be benefited if plowed a little dry, by packing. Whether or not it is absolutely necessary to use this sub-surface packer, except in special cases, is a question to me.

Expensive Machinery.

"It is an expensive practice and that is one of the things the dry farmer has to take into account, and we have got to reduce our expenses to the minimum, so let's not use anything that will not give us full results. It is a question every man has got to study out for his individual farm. It isn't something that anyone can recommend for all sections. There are, as this gentleman said, heavy clay lands all over this western region and I will say that probably the best farming that is being done is in the mountains and they never use a packer.

Summer Fallow.

"They practice summer fallowing systems and the ground is thoroughly packed and it leaves the finest kind of a seed bed. I would certainly be opposed to making any statement regarding the use of the subsurface packer and would only use it where it had been demonstrated that it will accomplish results, and I believe we have yet to find those results before we can recommend it universally."

Sub-Surface Packer.

A DELEGATE: "I am not in any sense interested in any tool, and I thought it would go without saying that we need not recommend a tool regardless of conditions; as they sometimes say when a manufacturer makes a tool, he don't furnish the brains to run it, but with the conditions under which we have used that tool, we have saved a great amount of time.

Gumbo Soils.

"I have used other tools and I never could accomplish so much with the soil we handle as with the sub-surface packer, but I certainly wouldn't use it on clay and gumbo soil; you would pack it so tight you could use it for bricks."

Sub-Surface Packer.

MR. BAINER: "We make it a rule never to use that tool when the ground is wet enough to stick to the tool."

MR. JARDINE: "I was only speaking of the objections all over the country and I am going over it most of the time. We on the ground know that most farmers know enough to run their own business, but they are likely to make mistakes. I don't believe there is a man in this audience can get up and say he never makes mistakes. If you go on and puddle your land it is a mistake that you will probably remember. It is a condition that exists regardless of instructions sent out by manufacturers, and they are very few .If they recommend it for loose land and not on hard land, why don't they give those instructions when they are sent out."

Soil Treatment.

A DELEGATE FROM MONTANA: "Isn't it poor plowing to plow land when it is wet?"

MR. JARDINE: "There is only one time and that is the best time. It is not necessary to tell a farmer when is the best time to plow his land, for he knows best, but when you are farming on an extensive scale, you cannot do it all in one time, and we have to use the time when we will get the best average conditions. There might be a time on that land when the sub-surface packer could be used to advantage. I am just speaking here of the average farm over the country. I know this condition exists and I believe here is the time to to correct it."

MR. BAINER: "I believe our time is up, I thank you."

KANSAS.

Prof. E. H. Webster, director of the experiment station, Manhattan, Kansas, addressed the convention as follows:

"Mr. Chairman, Members of the Convention:

"I am somewhat of a novice in this dry farming proposition. I happened to be raised in eastern Kansas where they have so much rainfall that they build ditches to carry the water off instead of carrying it onto the land.

Precipitation.

"Kansas has a good deal of diversification in general climatic conditions. This year we had about three or four time as much water as we wanted in one section and in another section we had so little that the weather bureau reported the greatest drouth which ever existed. Our problem is one which is quite complicated in taking a state wide view of the situation.

Experiment Stations.

"We have, however, in Kansas some sub-stations situated in the western part of the state, one particularly at Fort Hayes. The one at Fort Hayes has a tract of land of about 3,500 acres which is being used for an experiment farm for the western third of Kansas, which belongs to the semi-arid section, but we didn't have a drouth at that point this year.

Precipitation.

"The year before we had about thirteen inches of rainfall in June, July and August, so we can hardly compare the results there with Colorado or Wyoming, or some of the states farther west. The year before that we had from fifteen to seventeen inches of rain in the growing season, so that rather spoiled the results from a dry land standpoint. But I am not one who believes the climate is changing in Kansas.

Climate Not Changing.

"I have been told by men who had land to sell that conditions were changing; that the seasons were different, and that we never would have periods of drouth like we had in the early part of 1890, but I do not believe we have records that will substantiate a belief of that kind, and the farmers have got to study the question from a dry land farm standpoint entirely. They will have periods of drouth as well as too much moisture. Conditions change so much and so rapidly that it is very hard to establish a direct rule for farming, and the rules for one year do not apply to the next and in one section do not apply to another section in the state. We have to take these things from an individual local standpoint and make our discoveries in that way, instead of sweeping way over the state, and for that reason we have been attempting to induce the legislature to give us money enough so as to place men in the western and central portions of the state to study the local conditions as they exist. The different soil conditions, the different rainfall make one section different from another, and we must study the conditions on the farms. That would enable us to see and understand the conditions and what things must be expected. We cannot hope that the Fort Hayes station will accomplish everything for western Kansas, but if we can send men out over western Kansas, to study the local conditions, I believe we will accomplish a great deal that will be beneficial to the farmers to that section of the country.

Field Directors.

Live-Stock Fattening.

"I was pleased yesterday to hear the gentleman from Colorado state that he did not believe that grain farming under dry land conditions was a success, but he wanted to mix stock with the grain farming. That is one of the things we want to encourage the Kansas farmer to do. That is, by mixing stock with his grain farming and raise stock that will bring a good price on the market whether the season is favorable for growing barley, corn or wheat or not, and we feel there is an opportunity for raising poultry and cattle in western Kansas and we want to encourage that.

Poultry Raising.

Field Directors.

"That is one of the things we are planning to do; to place enough men in the field who can go to these various farms and study conditions from a stock standpoint and encourage the farmers to take up stock-raising and poultry culture together with their dry farming experiments.

Stock and Poultry.

"I know from experience that there have been times that had it not been for the stock on the farms, when the farmers would have to have left their farms more frequently than they have in the past.

Dairy Industry.

"And one thing else that has developed the western part of our country, has been the dairy industry. It has brought in hundreds of dollars when everything else was a failure.

Forage Profitable.

"We have failures in the wheat crop and nothing is realized from the grain, but there are very rare occasions when the farmer cannot grow enough forage to feed some dairy cows on his place. These are the things that go to make western Kansas successful, not growing wheat or any cereal. We are going to supplement that with stock raising and we are going to make a desirable and successful place for people to live in, and we are going to tide over the time of the scanty rainfall and we hope to encourage that industry in that section of the state so that it will double or treble the amount of money that will come into that part of Kansas, for the butter and cream which we will sell.

Water for Stock.

"There is plenty of water which can be raised from wells by pumps, wind-mills and gasoline engines. That is one of the very fortunate things for that section of the country, that there is that abundance of pure water for stock purposes.

Experiment Stations.

"The experiment station at Fort Hayes is working along these lines and is trying to determine the best system of culture and the best crops that can be grown in that section of Kansas.

Seed Breeding.

"But another thing we are working toward and asked for financial support for this year, is to breed grain, alfalfa, barley and oats in the western part of Kansas where it can be grown. I believe by breeding and close selection we can make a very material improvement in the seed. It is folly for us to go to Australia or Alberta or anywhere else for seed wheat. We expect to work on that line until we have breeding centers where we can depend on getting good seed wheat, good alfalfa and good seed corn. There has been too much exploitation of seeds by seed men and others interested, of some wonderful product that may be all right in the locality where it is grown, but transplant that into some location where the climate and soil conditions are different and it does not do what they said it would do. Therefore, we have got to breed these plants where they are going to be grown, and we hope to have funds enough to go into a number of sections and start this work of plant breeding, which is adapted to that particular locality.

County Demonstration Farms.

"We have another thing that I think perhaps the legislature will pass that will enable us to study conditions throughout the state. A bill was introduced not requiring, but making it a voluntary proposition that each county on the county poor farm set aside a certain amount of land and the county commissioners donate a certain amount of money for a demonstration farm in every county, and that is something that will be taken hold of with a great deal of energy by the county commissioners. This will mean the carrying out of the work in every county in the state in demonstrations in an experimental way, and enable us to study conditions in a small way and draw the attention of the people to the county farms of their own; the principal object being demonstration rather than experiment. It is along these lines that we hope to help Kansas and we feel good, for the governor and the legislature are with us to help extend the work out through the state."

MONTANA.

Alfred Atkinson, Professor of Agronomy, State Agricultural College, Bozeman, Montana, made the following report of the experimental work in that state:

"The practice of allowing fields to remain uncropped or to 'rest' through a season occasionally, has been identified with crop raising in many generations.

Summer Fallow.

"The increased returns after a field's fallow season led early agriculturists to believe that there was high fertility merit in the system: Again, the rapid increase of weed pests in many localities made some kind of summer culture imperative so that the practice of summer fallowing has been known and followed in most agricultural communities to a greater or less degree.

Crop Rotation.

"Throughout humid regions farmers have found that summer fallowing does not make for permanently high production, and the system has been replaced by carefully arranged crop rotations in many localities.

English Experiments.

"The experiments at the Rothamsted Experiment Station in England, continued over a long period of years, prove conclusively that in humid regions, allowing the soil to remain uncropped throughout the season, occasionally is a practice that can not be too strongly condemned. The plant food content becomes reduced very rapidly, and long before the

English investigations had concluded this class of experiments, it became evident that the practice is wasteful for a section with an average precipitation as high as thirty inches.

Summer Fallow.

"Summer fallowing has been identified with dry land culture almost from the beginning. That this should be the case is natural for in many dry farming sections the crops are light when grown every year, and the light rainfall eliminates one of the objectionable features by lessening the amount of leaching in uncropped soils. The number of carefully conducted experiments designed to throw light on the real effects of summer fallowing on the dry farm has not been large and much remains to be undertaken by investigators identified with dry farm experimentation.

Moisture Tests.

"During the seasons of 1907 and 1908 the Montana Experiment Station has been conducting some moisture and nitrate investigations on one of the dry farming sub-stations, and it is the purpose at this time to use some of the data accumulated on these tests. These data are yet unpublished as it is the purpose to continue the work over another season in order that safe conclusions may be indicated.

Plant Foods.

"When the work was begun it was the plan to conduct moisture tests only. Before the first season had progressed very far it became evident that the plant food merited some study and nitrate investigations were arranged.

Moisture Tests.

"Turning to the relation of summer fallowing and moisture conservation, moisture determinations were made to a depth of five feet in all cases with one exception when the depth of nine feet was investigated.

Moisture Tests.

"Determinations made every ten days during the summer of 1908 on land that had been continuously cropped for three years in spring wheat showed that this soil contained on an average of 7.7 per cent. moisture with a range of from 5 to 12 per cent. during the season. Allowing that this soil, an average loam, will retain 7 per cent. of moisture that the growing plant cannot use, we are not surprised when we find a yield of four bushels of wheat per acre produced on this plot.

Result of Summer Fallow.

"Investigations in 1908 on similar land producing the same kind of crop but which had been summer fallowed the previous season showed a moisture content ranging from 16.5 down to 6 per cent. with a seasonal average of 11.5 per cent. for the first five feet. While this increase is only 4 per cent., yet when we remember that the first 7 per cent. of the moisture is of no use in growth we see that the amount of available water in this plot was nearly six times as great as in the plot cropped in 1907, and explains the yield of 20 bushels per acre, five times as great as on the other plot.

Water Conservation.

"Again determinations made at the end of a season when summer fallowing was practiced, and carried to a depth of nine feet showed that this soil contained on an average of 11 per cent. moisture for this depth, with 19 per cent. in surface foot and 8.5 in the ninth foot. This shows something as to the possibilities of accumulating moisture in a soil as a result of a season of summer fallow. From these figures it is evident that the moisture accumulated in a soil during a season of summer fallow is an important factor in the production of the crops on the succeeding year, and further indicates that high yields ought not to be expected where some provisions are not made for accumulating a certain degree of moisture in the soil.

Plant Foods.

"Another equally important influence exerted by the uncropped condition is in bringing the plant food in the soil into a soluble state so that plant roots may be able to utilize it. Fortunately for mankind, nature has locked up her supply of those elements in the soil from which man must get his food and certain conditions have to be established before the food supply will be released. The investigations taken up were along the lines of available nitrogen or nitrates as throughout the western country where ash elements are commonly present in abundance. It is the supply of available nitrogen that governs the crop possibilities to a considerable degree.

Summer Fallow Adds Nitrogen.

"Nitrate determinations made in 1908 on soil that had produced a spring wheat crop continuously for the past three years, showed a seasonal average of 9.5 parts of nitrate in every million parts of soil, with a range of from 8.3 to 13.7 parts. Determinations made on like soil growing a similar crop the same season, after a 1907 summer fallow showed an average for the season of 34.5 parts per million or nitrate with a range of from 15.1 to 39.3. At the end of the summer fallow season the soil contained 40.8 parts per million of nitrate. These figures show the tremendous advantage in relation to the availability of plant food in the soil, resulting from a season of summer fallowing. The effect of this advantage appeared in the crop harvested. The yields of 4 and 20 bushels per acre as reported for the continuously cropped and summer fallowed areas under the moisture discussion places practical emphasis on the advantage of having the plant food brought into the proper condition in the soil.

Moisture and Nitrates.

"Considering these two points, moisture and nitrates, in their relation to crop production, it appears that moisture is essential in bringing plant food into an available state. During the growing season when a crop is being produced the moisture in the soil is so utilized as to be of small value in hastening the bacterial activities which bring about a state of solubility in the plant foods. With the early seeding necessary in dry farming, the soil temperature is not high enough to encourage nitrate forming activities before the plant roots are claiming a large portion of the moisture.

Plant Foods.

"It appears to be necessary to so manage dry land soils that opportunity is occasionally afforded for the plant food organisms to work under conditions of sufficient moisture during a certain period of the warm weather. The moisture is essential in the growth of the crops, but apparently no more so than is the plant food activities in the soil. Heavy rains may come during the early spring and replenish the moisture supply, but since the nitrates forming organisms appear to act very slowly under conditions of low temperature, we ought not expect high yields though the spring moisture may be ample, if we have not provided an opportunity for the plant foods in the soil to become available the previous season.

Bacteriology of Soil.

"There is a large and very important field awaiting the investigator who will take up soil bacteriology in the great plains country.

Summer Follow.

"From the figures presented on the foregoing discussion it would seem that the practice of summer fallowing more properly belongs to dry land agriculture than to the agriculture of humid or irrigated regions. It meets the requirements demanded by the organisms which make plant food available in the soil without the loss from leaching which is noted in humid areas. I do not wish to be understood as recommending the adoption of the practice by our dry farmers generally, unless tests which shall be conducted with the various inter-tilled crops show that they will not meet the requirements. It is the purpose to refer briefly to some summer fallow substitutes in the last part of this discussion.

Water Conservation.

"Moisture and nitrate determinations have been made on summer fallowed soils handled in various ways. The average percentage of moisture maintained in a summer fallow that was kept cultivated during the season was 16.84 against 14.91 in an uncultivated fallow, with 34.5 parts per million of nitrates while an uncultivated fallow contained 15.1 parts per million. The yields from these two plots were 20 bushels per acre after the cultivated fallow, and sixteen bushels per acre after the uncultivated fallow.

Weeds Waste Moisture.

"These figures show the necessity of keeping a piece of fallow land properly cultivated in order that the moisture will be conserved to be utilized in plant activities and by the succeeding crops. Allowing weeds to grow or permitting the surface soil to become compact by rains, makes conditions for the rapid loss of moisture and small yields. Since the soil produces no returns while being summer fallowed, it is important that we get the full benefit in the succeeding crops. The term 'summer tilled land' might be more proper than 'summer fallowed land.'

Crop Rotation.

"Because of the crop losses and the apparent oxidation of the humus content under a system of summer fallowing and cropping, it is important that other promising crop arrangements ought to be tested to see if a more profitable system cannot be introduced. In working toward this end we must remember that crops which are economical in their use of moisture will have to be included at frequent intervals if regular production is to go on each year. The crop rotation tests being carried on in various sections of the great plains by the office of dry land agriculture of the United States Department of Agriculture, have been most carefully and comprehensively arranged and will do much toward solving the questions connected with dry farm crop rotation.

Corn.

"Moisture tests made on land producing a crop of corn properly cultivated throughout the season showed an average of 13.5 per cent. for the season as against 16.84 for a properly tilled fallow. While this is slightly over three per cent. less in the case of the inter-tilled crop, yet it indicates the possibility of producing a crop and still retaining enough moisture in the soil to encourage plant food activities.

Soil Treatment.

"To conclude, the dry farmer must so manage his soil that it is not wholly dried out during the summer, in order that the plant foods may become available and also that he may fortify himself against an unexpected dry spell the following season.

Crop Rotation.

"Much experimentation will be necessary in the different localities before the best crop rotations may be adopted. If, as a result of investigations, crop plans may be introduced that will eliminate the summer fallow and permit of crop returns every year, it will be of great value to the dry farmers of this great West."

NEBRASKA.

Prof. W. P. Snyder, Superintendent of the Sub-Station Experiment Station, North Platte, spoke for Nebraska as follows:

"I shall not attempt to discuss conditions which exist throughout the entire semi-arid area, but shall confine my remarks to the country adjacent to North Platte, Nebraska, or to localities having similar conditions.

Precipitation Uncertain.

"North Platte is between the humid and the arid country. It seems a waste of labor to follow extreme dry land methods, and farming as under humid conditions invites certain failure. We are betwixt and between. One year is wet, another dry. In 1883 the precipitation for the year was 29.99 inches; in 1894, 11.21. The average annual precipitation is but little more than the difference between these, or 18.86 inches. This would seem an abundance to the farmer, in a part of Wyoming, where the average is 12 inches, but we should remember that the mere fact

Climatic Differences.

that two localities differ in the amount of precipitation, indicates that they also differ in other climatic features. These conditions may be favorable to the one or the other. And we should remember also where more is given, more is rquired. However favorable or unfavorable the

Many Failures.

climate may be, few parts of the country have recorded a higher percentage of failures among the early settlers, than western Nebraska.

Precipitation.

"Beginning in 1893, there were nine years in succession with the rainfall below normal. Every one knew we were in a dry climate, by 1902, and was ready to follow dry farming methods or expend money for irrigation. Beginning with 1903, we have had fives years with more than a normal amount of rainfall. This has led many to believe that western Nebraska has become a humid climate, though 125 miles southeast of North Platte there has been crop failures during 1907 and 1908.

"From a study of the climatic records, as well as 20 years experience in western Nebraska, we do not think that the climate has made any permanent change, as regards rainfall, wind, cold or heat. We believe that it is safer for the new-comer to consider that the changes which he wishes to see will be brought about because of his activities. rather than because of a change in the climate.

Farm Operation Lessens Epavoration.

"Anything that tends to retain more moisture in the country, will have a tendency to make the temperature more uniform and the winds more moist. The stopping of prairie fires and the tilling of the soil will assist in getting more of the precipitation into the soil. The erection of buildings and the growing of trees will check the sweep of the winds and thereby lessen evaporation. These things alone will give us the use of a larger percentage of the water that falls, and this produces the same effect as an increase in the amount of the precipitation.

Alfalfa.

"The proper varieties and kinds of crop will greatly increase production. The alfalfa plant, but little known in the United States twenty years ago, adds millions of dollars to the value of the west each year.

We hardly hope for another plant that will do so much, but we may find one that will approach it in usefulness.

Kherson Oats.

"The Kherson oats, introduced a few years ago, adds thousands of bushels to the oat production of Nebraska yearly, and is extending the oat area farther west. Turkey red and Kharkoy winter wheat are giving similar results. We have shipped seed of all of these into Wyoming. Of the value of the Durum wheat you all know.

Winter Wheat.

Fertilizing.

"No country can produce grain for the elevators permanently, without the application of commercial fertilizers. These are not to be thought of in the west.

Live Stock.

"Stock must be kept to consume the products of the soil on the farm, in order that waste material may go back into the soil, to maintain the fertility. The water holding capacity of the soil and the fertility are closely related. The keeping of good stock under proper conditions, is an additional source of profit. With ordinary market prices, grain or forage fed to stock, is sold at a higher price than if put onto the market direct.

Trees and Shrubs.

"With the increased production of crops and the growing and feeding of stock, there is bound to follow the growing of trees, shrubs and fruits. This will mean permanent, comfortable homes all over the prairie lands. All this may be brought about, and I believe will be brought about with the same amount of precipitation as we have been getting in the past. The normal rainfall is sufficient, if properly husbanded. It will not give the large crops grown in Illinois, but it will give crops that will support prosperous farmers.

Experimental Station.

"To assist in hastening the time when these results will have been accomplished, is the purpose of the sub-station at North Platte. This station has been in operation for five years. All of these seasons have had more than a normal rainfall; the two later only a little above the normal.

Durum Wheat.

"We have shown conclusively that the Durum varieties are superior to the common spring wheats, even when conditions were especially favorable to the common varieties. During the first three seasons, the durum varieties produced more than twice as many bushels per acre as the spring wheat, formerly grown in the locality. During the last two seasons, they have given from six to nine bushels more per acre than the best common varieties we have secured.

Winter Wheats.

"We have also shown that the Turkey red and Kharkov winter wheats give profitable returns. On a well conducted farm, it is highly probable that either of these will give larger yields than any kind of spring wheat.

Oats, Barley, Emmer.

"The varieties of oats introduced have given very much larger returns than those formerly grown in the locality. The Kherson oat gives the highest yield. Barley and emmer have been grown each season, with good results.

Hog Fattening.

"By growing and feeding hogs, we have shown how these grains and corn can be sold through the stock at a price considerable above that obtainable on the market. Even with corn at 50 cents per bushel and hogs at $5.50 per cwt., the hogs gave nearly 50 per cent. profit on the corn.

Summer Fallow.

"The rusults show conclusively that summer tillage stores up moisture and produces large yields. Winter wheat seems especially fitted for summer tilled land. In this way, winter wheat is made our safest crop. In 1907 4½ acres of winter wheat on summer tilled land gave an average of 59 bushels per acre, while land cropped the year previous gave 24.4 bushels per acre. In 1908, an eighty-acre field of winter wheat, on summer tilled land, gave an average of 57 bushels per acre. This contained 16 one-half acre plats of varying rate of seeding, time of seeding, and tests of varieties. The lowest yield was 53 bushels per acre, while an adjoining field that averaged 59 bushels in 1907 after summer tillage, yielded 20.85 in 1908.

Moisture Tests.

"The relation of the moisture content of the soil and crop yields is being studied carefully at the Experimental Sub-Station, North Platte, Nebraska.

Precipitation.

"The average annual rainfall for the past thirty-four years, as recorded at the government weather station at North Platte, is 18.86 inches. There is a very great fluctuation in the amount of rainfall in different years, and also in different times of the year. But the larger part of the rainfall comes during the growing season.

Soil Experiments.

"The soil is of the loose formation, a fine sandy loam of considerable depth. It is very uniform in character and therefore very suitable for experimental purposes. The soil is quite fertile and will yield abundantly when there is sufficient moisture. The two main questions in crop production at the present time are suitable varieties and the maintenance of the soil moisture. We will deal with the latter problem only, in this discussion.

Government Co-Operation.

"A considerable part of the figures given here, are the result of work in which the Sub-Station and the office of Dry Land Investigation are co-operating. Prof. E. C. Chilcott and Dr. L. J. Briggs represent the department in this work. Mr. W. W. Burr has had immediate charge of the soil moisture work.

Conservation of Moisture.

"Some of the most important questions, as well as the most easily demonstrated, have been answered by the work at the Sub-Station. For example, the results show clearly that by summer tilling, sufficient moisture can be stored in the soil to assist greatly in the growth of the crop, and that summer tilled land produces remarkable yields of small grain.

Average Yields.

"In 1907, four and one-half acres of summer tilled land produced 59 bushels per acre, while the field adjoining, which was not summer tilled, produced 24.4 bushels per acre. All conditions except the tillage, were the same. Two fields on the table land were seeded to winter wheat in the fall of 1907. One field had been summer tilled. The other had produced 59 bushels of wheat per acre during the season. The harvest of 1908 showed that the summer tilled field produced over 57 bushels per acre, while the other produced less than 21.

Effect of Summer Fallow.

"There were two fields on bench land during the same season. The surface of the bench land is 30 feet above the sub-surface water. One of these fields—eight acres—was summer tilled. The other field—five acres—produced a crop the season previous. The eight-acre field gave 57 bushels per acre from 16 one-half acre plats in variety, rate of seeding and the time of seeding tests. The other field yielded 29 bushels per acre. The lowest yield of any half acre plat in the former field was at the rate of 53 bushels, the highest at the rate of 66.9

Results of Methodical Work.

"We have some striking yields from different tillage in the season of 1908, with Durum wheat, oats and barley. The yields are for only one season, and therefore can be taken only as showing the great variation that may be produced in the yield from adjoining plats, because of a difference in tillage. These yields are from one-tenth acre plats on table land, not influenced in any manner by sub-irrigation.

Government Co-Operation.

"There are a few of the plats in the series of co-operative tests being carried on by the Sub-Station and office of Dry Land Investigation in co-operation. Prof. Chilcott, the chief of this office, explained the nature of the work at the first meeting of this association held at Denver.

Comparative Results.

"Durum wheat, on spring plowed wheat stubble, yielded at the rate of 22.7 bushels per acre; on fall plowed wheat stubble, 27.3, and on summer tilled wheat stubble, 40.5. Common six-rowed barley, on spring plowed barley land, yielded at the rate of 19.6 bushels per acre; on fall plowed barley land, 43.3 bushels per acre; and on summer tilled barley land, 67.7. Kherson oats, on spring plowed oat land, yielded at the rate of 34.4 bushels per acre; on fall plowed oat land, 68.5; and on summer tilled oat stubble, 82.3 bushels per acre. The plats giving these returns, lie side by side on a uniform soil.

Soil Treatment.

"The seeding was done on all at the same time and at the same rate. The difference in the yields can be accounted for only by the different methods of tilling the land. We do not presume that fall plowing will always yield so much more than either of the other methods, as it did this spring, but we offer these figures to show what a wonderful difference in yield may result from tillage. These are some of the results as represented by yields from summer tillage on the Sub-Station farm.

Moisture Tests.

"During the two past seasons, considerable attention has been given to the study of soil moisture. The results to date, indicate that the North Platte soil will retain only about 16 per cent. of water, reckoned in proportion to the dry weight of the soil. The winter crops as wheat and oats, will take out of the soil about seven per cent. of the moisture, or reduce the moisture in the soil to abount nine per cent., before the plants suffer drouth. It also seems apparent that such crops as the above, have use of the water in the surface six feet of the soil. In round numbers, one per cent. of moisture in a six foot column of the North Platte soil is equivalent to one inch of water.

Summer Fallow.

"Therefore, it seems evident that we can store by summer tillage, seven inches of water that may be available for the succeeding crop. This amount of water distributed as it is throughout the soil, is worth very much more—probably fully twice as much—as the same amount of rainfall.

Depth of Moisture.

"Another noticeable feature is that the moisture content of the soil is influenced to a depth of ten feet, possibly farther, by summer tillage. Whether the water driven to this depth, later becomes available for the use of the plant is not known. It is quite probable that the increase in yields from summer tillage, comes largely because of this deep reservoir of water, which is drawn on during the periods of drouth. The amount of water need not be so great, for even a little water at a critical time, may save the crop.

Alfalfa.

"Alfalfa seeded on such land, is much more likely to become firmly and deeply rooted than if seeded on land in which the sub-soil is dry.

Dry Farm Corn.

"The moisture samples show why corn rather than oats or spring wheat should be planted on the field deficient in moisture. In every field compared, the content of moisture in the soil in the corn field increased until about the first of July. There was an accumulation of moisture in the corn field, just as in the summer tilled field until about the date given. From that time on the amount of moisture in the corn field decreased rapidly, while in the summer tilled field it remained about constant. In the small grain fields, the accumulation of moisture was not so great and the decrease in percentage of moisture began much earlier in the season.

Water Conservation.

"A difference of four or five inches in the amount of water stored in the soil, may mean a very great difference in the yield. There has to be put into the soil, we will say nine inches of water before the soil gets all it takes for its own use. If twelve inches are put in then there are three inches for the use of the crop. If sixteen inches are stored, there is more than twice the moisture available, than there is in the case where twelve inches are stored. This should mean a larger yield. In the spring of 1908, plat 'A' contained 12 per cent. of moisture in the upper six feet of soil. In the fall, it contained 9 per cent. It also received, during the growing season, about sixteen inches of rainfall. No doubt some of this ran off. The plat yielded at the rate of 22.7 bushels of wheat per acre. Plat 'D' in the spring of 1908, contained 16.5 per cent. of moisture, or four and one-half inches more water in the first six feet of soil than plat 'A.' This plat lying beside plat 'A,' received the same rainfall. It contains 10 per cent of moisture in the fall. This plat had been summer tilled the previous year. The yield on it was at the rate of 40.3 bushels of wheat per acre. Three and a half inches of water would not account for the difference in the yields of wheat, were it not for the fact that this water was available at the critical periods, and tided the crop over from one rain until another, without any check in the growth.

Drouth Resistant Crops.

"The cry in the west is for drouth-resisting crops, and by this, many of us mean crops that will grow and make grain for forage during seasons of drouth. Some plants will build up more food material from a given amount of water than others, and some will lie as if dormant, while others would die under the same conditions, but we should not lose sight of the fact that although every plant is very drouth resistant, it is not likely to get more water on the dry farms than it can use to advantage. In order for any plant to make grain or forage, there must be a considerable quantity of water somewhere within its reach.

Alfalfa and Brome Grass.

"The soil in an alfalfa field on table land, did not show more than 12 per cent. of moisture in the first six feet, at any time it was sampled during the past season. The alfalfa drank up the water of each rain storm within a few days after it fell. A brome grass field never showed as much as 9 per cent. The tonnage was fully one and a half tons of alfalfa and less of brome grass. The rainfall in these fields was recorded in the growth rather than in the moisture content of the soil.

"These two plants are drouth resistant, not because they build up forage without water, but because they can wait for water. This is as much as we should hope from any plant that may be discovered. The alfalfa field has been sampled where it showed as low as 6 per cent. of moisture in the sub-soil. All the available water had been used. If the alfalfa were broken up and the land seeded to some other crop, that crop would be dependent absolutely on the rainfall of that season. There would be no reservoir from which it might drink during the period of extreme drouth.

Crop Rotation.

"With plenty of moisture available we would expect a large crop following alfalfa. This work is explained more fully in Bulletin 109, and other bulletins that will be published later."

DRY FARMING AND LIVE STOCK FATTENING.

W. L. Carlysle, formerly Dean of the Agricultural College and one of the leading live stock experts of the West, was called upon and spoke as follows:

"Mr. Chairman, ladies and gentlemen: I think I am the most surprised man in Cheyenne at the present time. I was sitting over there in a box with some fellows from Washington and really enjoying myself, and enjoying the excellent addresses from the representatives from the various experimntal stations, and I was just congratulating myself that I was out of college work and wouldn't have to give an address. I didn't think I was on the program and I didn't have an idea in my head to present to the convention, so that what I will have to say will be very impromptu and very brief. If I had thought about this any length of time I might have given something. I want to say, Mr. President, and I think it is due the good people of Cheyenne that it should be said, that I appreciate more than I can say the excellent entertainment being provided for this convention. In the past sixteen years of my life, that I have spent more or less in public life, I have attended a great many conventions, in a great many places, from the Atlantic to the Pacific, and never before have I seen such perfection in arrangement as you seem to have here for the accommodation and pleasure and interest of the people of this convention.

Dry Farm Forage.

"Now so far as growing forage crops under dry farming conditions for live stock is concerned, you have a man here much more competent to speak on that subject than I am. He has a subject announced on the program, and I know his experience will be of much value to you. If you think of engaging in live stock in connection with your work, and if you have not thought of the subject, you are bound to think of it in the future, because no dry farmer is ever going to be permanently prosperous without stock raising.

Live Stock Value.

"The history of all dry farming is, you must keep humus in the soil and you must keep live stock in connection with your farm in order to do this. I was down in Kansas last summer and found people raising wheat, raising wheat, until now there is nothing but weeds. Those people don't know what to do on their farms to get rid of the weeds. They tried to introduce sheep, but they are going to find out that summer fallow is not going to answer every purpose.

Soil Fertilization.

"They must have live stock; they must have manure. They must rotate their crops with grass crops and keep up their live stock. Now what crops to raise I am not prepared to state. I have given some study to the crops which we have found to be best adapted for Colorado

Broom Grasses.

"They are the broom grasses; those have given us, I think, the best results and successes of any. I don't know to what extent they have been raised in Wyoming, but they have given the best results down there. Some people have tried ordinary creek grass. That, I don't think, has ever given any success. The best grass to raise for forage purposes for live stock is the corn grass.

Corn Grass.

"You know corn is a grass; really, it is a great big overgrown grass, and no grass in the world is like it for forage purposes. It grows every year and the yield you can produce from corn grass is greater than from almost any other plant you can raise, and I was very glad to hear Prof. Atkinson's remarks on the results of the growing of corn, conserving the moisture and conserving the nitrates in the soil, because that means a whole lot to the live stock men of this country. Now, with the corn plants, and various varieties of them, and as we come to the breeding and selection of them out here, the improvements which we have made in Colorado are going to make a wonderful difference in their adaptation to our conditions. I expect to see Wyoming raising lots of corn for forage, and your sheep will certainly appreciate it.

Corn and Sorghum.

"Along with the corn our sorghum is going to be valuable. Millett is going to be very valuable, because it grows in the latter part of the season and we have the first part of the season to store up moisture and develop plant food. Now, Mr. Chairman, I am not going to take up any more time. If I had known I was going to speak, I would have provided something worthy of your attention, but I hope that during the convention I will take part, and I hope when Mr Bell of Laramie, starts on his subject, 'the dry farmer and the stock grower,' you will try to bring out some points of particular interest to the dry farmers of the West."

NEW MEXICO.

Prof. J. D. Tinsley, Director of Experiments at the State Agricultural College of New Mexico, said:

"In New Mexico we have no experimental stations at all, and our main experimental station is in a district where we believe it is too dry for dry farming. There have been years when the rainfall goes as low as three and a half inches, and in 1904 it went to seventeen inches. Of course, if we had known it was going to be seventeen inches, we might have planted some crops and gotten some pretty good yields. The people of New Mexico are very much intrested in dry farming. Those who have been in the territory longest were, of course, hardest to convince. Every week or two I see settlers stringing out into a new locality where I would be willing to bet they were going to fail, but at the same time a fellow would take a risk when he gambles on them, because they have already done pretty well in localitis where it looked like they were beyond possibility, so I have come to the point now where I do not give advice, but let them go ahead and try it and see what they can do; that is the only way they will find out. From this platform yesterday and this morning, we have heard some beautiful ideals set before us and something to look forward to in the days to come, but at present the vision is rather hazy.

Farm Equipment.

"My heart leaped when I heard of a farmer who had four fourteen hundred pound horses and possibly two men to put on the plow. Now, if we had to have four fourteen hundred pound horses in order to make a crop in New Mexico, we would have to quit right now. We would have about one farmer on each ten townships. Some of you who have been in the West longest—I suppose there are men here familiar with the settlement of Oklahoma and western Kansas—and when I tell you we have got a lot of fellows down there that didn't succeed in Oklahoma and western Kansas, and some that got restless over there, you know what that means. You know the size of a pony they drive in New Mexico compares with a fourteen hundred pound horse about like a cat compares with a rat. What we are trying to do in New Mexico is to make a living on 160 acres. We are trying to do it in the majority of cases with two rat-tailed ponies, weighing five or six hundred pounds I know one man last year who had two mules which averaged three hundred and fifty pounds apiece, and I want to say he grew enough stuff with those mules to feed them.

He had an eight inch plow and a pretty short section of harrow, but he stayed with it. If a man in our country had big teams and worked as hard as he has worked, a good many of them would have gotten a better proportion of yields, but that is the problem we are up against in New Mexico.

Problem of the Homesteader.

"Over a large proportion of the territory of New Mexico it is a homestead proposition, and men are coming in there with $500 and everything else they have in the world on two-horse wagons. They are settling out on the bare plains on 160 acres and undertaking to make a living. When I tell you that these settlers are using good judgment, following methods and are remaining on their homesteads, and that every one who stays has more than when he came, you will agree that it speaks well for the future of dry farming. With us it is not a question of the present time; the question is, can we hold out and stay there, and get things in such condition that we can live comfortably. Many of our men had nothing when they came, so that if they go out 'broke,' they wouldn't go much worse off than when they came. Of course, we have men with big teams and machinery. I do not worry about them, because when they are absolutely forcing Illinois and Iowa methods on us, I know they stand a show of succeeding.

Unfavorable Year.

"I might say the past season in New Mexico was quite unfavorable. The preceding winter was dry and we had a late spring, and our rain fall until the first of July amounted to very little. I tell them down there we have two seasons in the year, winter and summer, and its pretty hard to tell where one starts and the other stops. About the 15th of April we generally think the beginning of summer, but, instead of that a year ago, we had about ten inches of snow in the lower plains country, and at some points it was almost as cold as in winter. But we did have some good days in March and a number of settlers got restless and put in some ninety day corn. In some cases there was moisture enough in the ground so that it got up that high (indicating) and stood there ninety days and didn't die, but when it did get moisture, it shot out tassels and we got nothing but nubbins and the crop was a failure. They are gradually learning the lesson that they must wait until summer comes before planting, and the great majority of those people who came out to New Mexico to show us how to farm in the last year or two, since last year's experience, are looking around for information, and, fortunately, they are gathering a little of it.

Study of Local Conditions.

"The hardest proposition is to get a new settler to realize that each locality has its own peculiar problems, and that his work must be adapted to the local conditions. In New Mexico we are farming from 2,700 feet in the extreme end of the territory, to up here on the Colorado line, in Colfax country, at 8,000 feet. And not only that, but between those two localities there is 400 miles of latitude about 5½ degrees, so that we have a great variety of conditions and our rain fall, the best in the territory, is extremely low.

Precipitation.

"It will rain on the crown of your hat and never wet the brim. So that we cannot talk about rainfall in New Mexico. We can scarcely talk about the rainfall of a certain county. The elevations are slight in that stretch of land there which forms the state plains, and makes quite a break there. This year our rains came from Texas and they lapped over on us and gave us a splendid season in southeastern New Mexico. That moisture came up to these breaks and from there north it is extremely dry. So we have a great variety of conditions, and we are trying to learn how to adapt ourselves to those local conditions.

Effect of Altitude.

"The territory can be roughly divided into those parts lower than 6,000 feet and those above. Below 6,000 feet we have all of that eastern country adjacent to the pan handle of Texas and running on south, in which we are growing corn, and milo, and kaffir corn, and sorghum, and some people are succeeding with potatoes, and we are experimenting with wheat. Now, I personally am convinced that the small grain proposition for that portion of New Mexico below 6,000 feet is a matter of less importance. The crop is less important.

Time of Seeding.

"We have some reasons to think from experiments that it is going to be possible to sow small grain there from the 15th of May to the 15th of June, and harvest it about the 1st of October. If we can do that we can get the rain and moisture on that grain at stooling and filling, and stand a show of making a crop We have not practiced summer tillage and it will be a long time before we can bring or pull our farmers around to it; they would never do it until they got hungry.

Effect of Altitude.

"The high elevation is much better adapted to small grain growing, especially oats and barley, and considerable experimenting is being done up there, but we are very liable to drouth at stooling or filling time, or both, so I do not think that small grain will ever be important to New Mexico, that is, as important as it is farther north. As a matter of fact, I see no one crop that is going to predominate in that country, and I am exceedingly glad of it.

Live Stock Feeding.

"Now, I agree perfectly with the gentleman who spoke this morning, that the dry farming proposition is going to come to a live stock proposition. I believe that is where the money lies. Even if we grow wheat, I doubt if we will ever get as much for it sold at the elevator as we can by shipping it as fatstock. In New Mexico we have a live stock proposition, but the question is, how are we going to get to it? It is going to take us years. It is no use to start in on milch cows. The settlement of New Mexico has been so rapid that it has forced the sheep and cattle industry entirely off the field, simply crowded the range cow out, and the ranchmen have to go over into the drier districts to pick up cattle for feeding. There is little use for people with a comparatively small yield of stuff to undertake to feed that to low grade milch cows, for there are not enough milch cattle in New Mexico. If we depended on local bred stock we would not have, in the next ten years, enough to supply half the farms with milch cows. We haven't enough money to go outside and buy stock, and the money that comes for future buying of that stock has got to be made out of the home crops that we raise; therefore, the cry in New Mexico is for money crops, and Indiana corn is answering that purpose very well.

Dry Land Cotton.

"We are trying cotton, and year before last there were several hundred bales of cotton raised there that represented one-third to one-quarter of a bale per acre. It was very good short staple upland cotton.

Broom Corn.

"Broom corn is another crop that is promising. They grow a good grade of broom corn, but don't know how to cure it, and another thing is the lack of knowledge of the business side. The farmers do not know how to handle their stuff on the market after they get it.

Finding a Market.

"Today in Roosevelt county there are over one hundred car loads of corn ready for shipment, and those people didn't start to look for rates until a few weeks ago. They didn't know where it was going or what they were going to do with it. The market question confronts every locality, and it is a problem that we have got to let settle itself. Broom corn is a good crop for them, and the Mexican bean is another good crop and a safe one; if they can get anything at all, they can get the Mexican bean.

Forage Crop.

"Then comes the forage crop, so that whenever it is a bad year, they can get considerable forage, and I have seen Siberian millet mature there in seventy days, so I cannot see how we can get a system so that we cannot make enough feed to run what livestock we have half through the year. I believe while using good judgment we can always make a fair existence and when I say that I know how dry it has been there some years.

Corn.

"They are farming today on a spot where a man I know personally lost 8,000 sheep in 1904, but we have learned since on that same identical strip of country that a man can get as high as 50 bushels of corn to the acre. You see we have considerable possibilities along dry farming lines.

Now we get up to our 6,000 feet of elevation and from there to 8,000 feet and of course that influences the character of our crops.

Cereal Crops.

"We have to pay more attention to our small grains up at 8,000 feet. I know of land that has been cropping oats for 14 consecutive years and now they make 40 bushels of oats to the acre. The beardless barley is coming into that country considerably and in spite of all to the contrary we are growing pretty good corn.

Corn.

"You take Australian white and it comes nearer maturing in 90 days than anything could. It doesn't waste any time in making stocks. I know one fellow who had a field where the ears were so close to the ground that he couldn't cut them with a corn gatherer. In his district the season was quite dry, yet he made 25 bushels to the acre. The rainfall was about 15 inches."

LARGER HOMESTEADS.

MR. McCOLL (presiding): "I would like to say here that I have been really shocked to find any legislature asking men to make a living on any 160 acres of land, the kind of land that I have traveled through in this country.

Australian Land Laws.

"In Australia, for the best land it is 160 acres; for the second class from 320 to 640, and next to that 3,500 acres, so you see how unreasonable it is to ask a man to make a living on a small area in this country."

INVITATION FROM DENVER.

The secretary read the following communications:

"To the Officers and Members of The Trans-Missouri Dry Farming Congress, Cheyenne, Wyoming.

"Gentlemen: I am pleased to join in the invitation to your association to hold your next session in this city. Denver is rapidly becoming the convention city of the United States, owing to her rare and numerous attractions. She is now become famous as one of the cleanest and most beautiful cities, with the finest climate in the world and mountain scenery unsurpassed.

"We are of easy access, over scenic railways, to the famous mining camps, which have contributed so much wealth to the world. Besides, Denver is peopled with men and women noted for their hospitality, and they will heartily join with the city administration and commercial organizations in making your visit here one never to be forgotten.

"We have just completed a splendid auditorium, and our facilities for accomodating conventions are as good as any city in the country.

"Earnestly trusting that you will accept our invitation, and will give us the pleasure of entertaining you in Denver, I am.

"Very truly yours,
"R. W. SPEER, Mayor.

"Denver, Feb. 22, 1909."

"Denver, Colo., February 23, 1909.

"To The Trans-Missouri Dry Farming Congress, Cheyenne, Wyoming.

"Gentlemen: Representing a membership in every part of the state of Colorado, and for and in behalf of the whole state, The Colorado State Commercial Association cordially invites The Trans-Missouri Dry Farming Congress to hold its next meeting in the capital and metropolis, the city of Denver.

"The merits of Denver as a convention city, its adequate hotel facilities, its railroad and street car accomodations, its numerous theatres, parks and pleasure resorts, and the hospitality of its citizens are matters of commendation in every part of the country.

"The large areas of lands in eastern Colorado which will probably never be accessible to water supply from irrigation systems, makes the question of dry farming, or scientific methods of farming with the moderate supply of moisture by natural precipitation, of prime importance to every resident of this section of the state, and of the people of Colorado generally.

"Modern methods of farming are little known and only just begun and the education to be disseminated by meetings such as this Congress, will be more far reaching and beneficial if held in a city of the size and importance of Denver. Our earnest and hearty co-operation will be given the movement in any event, but an added incentive will be given us to make the meeting a success from every standpoint, if held in the city of Denver.

"With heartiest wishes for the success of the present meeting, we are

"Yours most sincerely,
"W. E. SKINNER, President.
"J. C. CRAIG, Secretary.

"This invitation is supplemented by invitations from the Governor of Colorado, the Mayor of Denver, The Denver Chamber of Commerce, The Denver Convention League, and The Denver Real Estate Exchange.

"J. C. CRAIG."

"Denver, Colorado, February 22, 1909.

"To The Trans-Missouri Dry Farming Congress Convention, Cheyenne, Wyoming.

"Gentlemen: The Denver Real Estate Exchange extends to your body a most cordial invitation to hold its next convention at Denver, Colorado. The many advantages that Denver offers as a convention city are so well known that nothing need be said from this standpoint. We, however, beg to assure you that if you favor us with the next convention, we will do all in our power to make the meeting both interesting and profitable to those who attend the convention.

"Trusting that this convention will see fit to name Denver as the next meeting place, and with the hope that the present convention will be a most successful one in every respect, we remain,

"Yours very truly,,

"DENVER REAL ESTATE EXCHANGE,

"By E. R. CONAWAY, President."

A number of resolutions were presented and according to ruling were referred to the Committee on Resolutions.

Adjourned until 2 p. m.

Fifth Session, Wednesday Afternoon.

The Hon. J. H. McColl, presiding.

Mr. A. J. McCane, of the South Dakota Experiment Station, addressed the Congress as follows:

"It is with pleasure that I greet this audience whom I know are intensely interested in the industry that is the foundation of all wealth. Mr. Chairman, I think that you have taken snap judgment on me, however. I was not aware that I was to make an address. Now if I had been prepared and been in the congress of the United States this would be called my maiden effort and I think that you will understand before I am through that I have made an effort, whether successful or not. It is with double pleasure that I greet you for the reason that I believe you represent the brains and brawn of the civilization of the central west.

I am not saying this to compliment you beyond what you deserve, because you are trying to devise some better methods by and through which you can help the farmers of the United States. Now, I know that you are representatives of all the people of every class of the industry in the world. For this reason you meet here unselfishly; you meet here for the purpose of preparing yourselves the better to enter into the industry and avocation that you have chosen for your lives; the mastery of better methods of agriculture and this is certainly one of the most important studies of today. We find every other industry devising means and resorting to inventions in labor saving machinery, so that they can economize in the production of everything that the farmers have to buy and consume, and we certainly ought to sit up and take notice and endeavor to devise means whereby we can produce at a better profit to ourselves the things that the industries of the world have to purchase from us and are dependent upon.

Business Methods.

"We know that if we permit agriculture to stand still and do not keep to the forefront with new methods, that every other industry must in proportion sway and decay, because they all rest upon this one foundation. Some of you can remember well when the state of Pennsylvania held the banner as the wheat growing state of the Union. You probably studied the same physical geography that I did and you can remember how proud we were to recite the lesson, those of us who belonged to the Keystone state, and you can remember how our pride was crushed when we had to surrender our honors to the state of Illinois, and Illinois in turn to Minnesota, and Minnesota to the Dakotas, and you will remember Ohio was the banner corn state of the United States and had to surrender her honors to Illinois, and Illinois to Iowa, and Iowa in her turn to Nebraska and Kansas, who are now vying for supremacy with South Dakota, who is not a slow competitor in the race. At the time that we were studying the geography that gave Pennsylvania the banner, we were also conning a map of the United States with great uninviting blots on its face that covered a great deal of the territory in the central west, without a line to designate the highways of commerce, without a dot to mark the place of future cities and—little did we realize,—and it is hard for us to realize today, that a convention of agriculturists, intelligent men, well-to-do men, meet today almost in the geographical center of the American Desert, the Sahara of America; and recognize the fact too that not only the localities of the eastern states that used to furnish the food of men and beasts, but the eyes of the nations of the world are upon us and looking to us for future sustenance both for man and beast. Hence, it is very important that we study more and better methods and devise means whereby we can better cultivate the soil.

"Now, this is my first meeting with you in The Dry Farming Congress and I may ask a few questions before I get through and some of you may have an opportunity of answering them later on. But it is not the last time I expect to be permitted to be with you. And I believe today we would have had a great deal larger an assembly here if it had not been for this snow blockade. But there is one consolation, you can know that the Lord is on our side and that the old adage, that the Lord helps those who help themselves is being fully substantiated, and now if we will only take pains to acquire the knowledge and experience that will enable us to conserve this moisture that a kind Creator has placed here for our use, then we have accomplished our end to a great extent at least. Mr. Chairman, I am a representative from the state of South Dakota, and we are represented here, I think, with six delegates. I don't know whether we ever had more than one representative before and I felt at this time we ought to have twenty and made an effort to have a larger delegation. I represent the western end of South Dakota and I have one fellow delegate with me—I think I see him in the audience in the balcony—and I insist that he should make a speech, because he is a man who has had much more experience than I have in dry farming, and he is making a greater success, and he is buying the machinery, but I am going to tell you that I am going to be a dry farmer, if I can borrow his machinery.

Average Results.

"My friend, Mr. Holcomb, should have gotten up here and told you how he had raised 40 bushels of winter wheat to the acre in South Dakota in a range country where 20 years ago we were told through the eastern newspapers that it was only fit for jack rabbits, coyotes, range cattle, cowboys and sheepmen. Now, with us in South Dakota we have conditions that probably you do not have in some other states, especially as near to the mountains as some of you are situated here.

Gumbo Soil.

"Our soil is a deep, heavy gumbo soil, largely mixed with gravel. That makes it very difficult soil to work, and we find a great deal of motive power is required to break the soil and turn it over. We have an elevation of only 3,229 feet in the western portion of the state. At

Pierre, not quite the lowest point in the state of South Dakota, the elevation is 1,437 feet.

Irrigation Area.

"The western portion of South Dakota extends from the Missouri river to the Black Hills with a probable area that can be placed under irrigation of 1,000,000 to 1,500,000 acres, estimated out of 23,000,000 acres of land. I might add 500,000 more acres that could be put under irrigation by conserving the water in reservoirs in our long dry creeks. We are beginning to learn the lesson of conservation of moisture, but we have not advanced very far. Nearly all of the people in the rest of South Dakota have engaged either in mercantile, mining or the live stock business, and those of us who come here today, come as pupils not as teachers. So I think it is very improbable that I can give you any ideas that will aid you. But I may ask questions and describe conditions existing that some of the rest of you who are further advanced may be able to discuss when you come before the audience.

Alfalfa.

"Now first, our state is the home of alfalfa, we discovered that a number of years ago. Our county, the county of Pennington, in which I live, has about 3,500 acres in alfalfa under irrigation. We will probably increase that acreage to 5,000 within the next twelve months, as a great many contemplate sowing alfalfa in the spring. During the last three years we have considered it was time thrown away and money thrown away to sow alfalfa seed on the table lands, as we believe it could not be cultivated there successfully, but a few men who have dared to go out on these high table lands and sow alfalfa have had marvelous success. I had in mind one gentleman, who, in the summer of 1907, had 50 acres of alfalfa. He had 12 hogs that were as fat as though they had been fed on corn. He assured me however that the hogs had run in the alfalfa fields and for the first crop he put up 57 wagon loads of alfalfa from 15 acres. His second crop only produced 21 loads on the same tract. He has been raising alfalfa on this plat for eight years and he has never used the alfalfa harrow nor anything except to let the hogs run in it.

"Our state has various resources; we have something more besides agriculture. In the state of South Dakota we claim for it, that it has the richest mine, plumpest cereals and the most nutrious native grasses, the choicest alfalfa, and that we have the purest water, the best climate, the finest scenery and the brainiest men and women of any state in the Union except Wyoming. Now, what we would like to have is some farmers, thousands more who will adopt better methods of cultivating the soil. Now, myself and a few other men interested last year invited Mr. Campbell to come to our town during the county institute and deliver a lecture which he did. In remuneration we raised 100 subscribers to his paper and then a banker in town took 100 more subscriptions and sent copies to 100 more people, so that we believe that in time we are going to be dry farmers. We hope that you will attend the next convention and then that you accept our invitation to come to Rapid City in 1911."

UTAH.

Dr. John A. Widtsoe, president of the Utah Agricultural College, who was to have delivered an address had been called away upon important business matters and J. W. Paxman, a prominent ranchman of Nephi, Utah, was called upon by Chairman McColl to respond for his state. Mr. Paxman spoke as follows:

"Dr. Widtsoe until this morning was here for the purpose of giving an address to this convention, but I very much regret to say that at a late hour last night he received word that the affairs in his office at home demanded his return. We regret this because it will cut Utah out of a very fine speech by his not being here and not only that, but his talk would be a good one for the convention. Dr. Widtsoe is looked upon in Utah as the very brighest man in the state on the subject of dry farming, in fact we look to him as the father of scientific farming in Utah and he has done more good for that country in the way of reclaiming the desert than any one man in that region, and we very much regret that he is unable to be present at this time, and we would like to have Dr. Widtsoe submit a paper to go into the proceedings of this Congrees so that his thoughts shall be your property, and the Utah delegation requests of you that you permit the paper to be submitted by Dr. Widtsoe to go into the record."

Rule Widtsoe.

MR. McCOLL (presiding): "We all join in the regrets that Dr. Widtsoe could not remain and I take it to be the sense of the meeting that Dr. Widtsoe's paper will go into the record."

Change in Committee.

MR. BOWMAN, of Idaho: "I would like to state here that A. J. McCane, of South Dakota, has been substituted for S. H. Lea, on the Resolutions Committee."

Telegram of Regrets.

The Secretary read the following telegram:

"Sterling, Colorado, February 24, 1909.

"Mr. John T. Burns, Sec'y, Dry Farming Congress, Cheyenne, Wyoming.

"The universal and excessive supply of moisture in the form of snow in the wide area covering the states of Nebraska and Colorado makes it impossible for me to reach Cheyenne in time for the Dry Farming Congress. I regret very much that it will not be possible for me to attend.

"G. W. HOLDREDGE."

UTAH.

MR. McCOLL (presiding): "Prof. L. A. Merrill, of the State Agricultural College at Logan, is the next speaker, but as he is not present his brother, Dr. Fred W. Merrill, with the permission of this Congress will speak for a few minutes."

Dr. Merrill spoke as follows:

"Mr. Chairman, Delegates to the Convention, Ladies and Gentlemen: I appreciate the honor given me of responding upon the program in place of my brother, and in doing so, it is with much temerity because of the prominent part he has taken in the previous proceedings of this Congress, and because of his eminent success in solving this great problem.

Dry Farming Not New.

"This is not a new proposition to Utah people, for we have been operating without irrigation for upwards of thirty years. Honorable George L. Farrell, who is to speak to you tomorrow is one of those who has farmed without irrigation for that length of time. Our success is due to the conservative plans upon which we have operated and to the fact that we have been responsive to the investigations and observations of our scientific experimenters. Also we learned in the beginning that every farmer must plan and follow his own system.

"We have no set system for any locality nor for any farm. Every man has his own problems and works them out in his own way. Our scheme of agricultural education has done much to advance the work of this arid farming scheme. Agriculture is taught in all the higher institutions of learning, both public and private, and also the majority of high schools teach courses in agriculture, the effort being to impart agricultural information, and to instill into the minds of the young people a love for agricultural work.

"There have been no failures in Utah in arid farming, owing to the conservative plan upon which we organize and operate. There are few single farmers who have entered the field very extensively. Our Executive Committeeman, Mr. Paxman, is an exception however, having gone into the system quite extensively, and has been eminently successful. The more popular plan is for a number of farmers to organize into a company and operate on a large scale, using steam power, thus economizing on time, labor and expense.

"Gentlemen, we are not worried over conditions in Utah. We have passed the experimental stage, and are now getting results from beyond our fondest anticipations."

DRY FARMING AND RAILROAD DEVELOPMENT.

Address by Geo. E. Bidwell, former general manager of the Chicago & Northwestern Railroad:

"Mr. Chairman and Gentlemen of The Dry Farming Congress: I am not prepared to say anything more than to extend to you the greetings of the Chicago & Northwestern Railroad Company, and of its president, who had fully intended to be here in session, but a call elsewhere made it absolutely impossible for him to be present. A few minutes ago I was asked to represent the company upon the platform of this Congress. I have frequently been pressed into this kind of service with the suggestion that the people assembled would like to look a railroad man in the face, to see if it is really true that he wears horns on his head and has hoofs on his feet, as the public might be led to suppose by what they read in the newspapers. On that ground I am always glad to look any convention in the face, and show them that we railroad men are men in the truest sense, and so far as our company in this Trans-Missouri country is concerned, you all know they have been in the foremost ranks in the development of the country, by extensions of their lines even in advance of any population whatever going into the country. The company which I represent are friendly to you. The gentleman from South Dakota who just spoke knows that 20 years ago the company built 750 miles of railroad in advance of any inhabitants, and it was 15 or 20 years before the company ever received enough revenue to produce them a penny of profit on their investment. But the president of the Northwestern Railroad Company and the board of directors who stood by him saw, even 20 years before they realized anything on their investment, what was in that great country. This was not only in South Dakota, but in all the Trans-Missouri states.

Transforming the Desert.

"As I look at these signs seating the delegates I notice that they are all Trans-Missouri states. We, who are not at present in the schools and colleges of the country, will remember that in the geography which we studied in our day—this country, starting from the west bank of the Missouri river and extending through to the Rocky mountains, was put down on the maps as the great American Desert., and in those days any man would have been set down as a candidate for the insane asylum who would ever have ventured to assert that that territory could produce a crop sufficient to support a population, and there are many reports made by explorers,—people who have been over this country,—which commit those representatives to the proposition that it would not support a population. And yet, the state of Nebraska east of the 100th meridian had proven itself to be capable of equalling any state in the Union in its production. West of the 100th meridian, profiting by experience in that country, the farmers have taken up the question of arid or dry farming. There are some stations along the lines of other railroads in Nebraska where, even since I came into the country 12 to 15 years ago, it was supposed by the inhabitants themselves that it was impossible to raise a crop, or support any population. However, under the experiments that have been going on, there are some of the best crops in that arid section that have been produced in any similar country.

Railroad Interest.

"And so the railroads desire to be understood by all of you that they are interested in this kind of development; that they are with you; that they are with you in co-operating in any legitimate way and in any legal way. It is so in Wyoming. All the railroads in this great state developed their lines and made extensions in advance of any traffic whatever, seeing in the future the wonderful possibilities of development.

Immigration.

"Now, as this system of dry farming is becoming of more interest to the inhabitants, and they are beginning to reap some benefits from it, I predict that the percentage of development will be greater than in any other states in the Union. There is one suggestion I want to make to those who are inhabitants of this country which is maligned so much and which has such a reputation for being unproductive, and that is, that everything in this life goes by comparison. The gentleman in New York who is connected with the financial centers becomes a man of considerable fortune, but even his fortune is considered small or great as he compares it with the fortunes of those about him or who associate with him. So it is in all aspects of life.

"I have been very much interested in taking up the study of statistical information in connection with the agricultural development of this country, and in noting the census, and I wish to ask every delegate here to impress it upon his fellows who he is trying to educate and interest in the development of this country, to take up these matters and use this system of comparison. Take the census ten years hence and compare it with the census of 1900 and 1890 as to the development of these Trans-Missouri states, for it is of the Trans-Missouri states I am speaking, the states where this dry-farming proposition is going to work in the next ten or fifteen years, and I predict in that time you will find the largest percentage of development in connection with farming in all aspects than in any other states in the Union. There will be a larger percentage of development in the present ten-year period than has ever occurred in any state in this great country. I predict that Wyoming, South Dakota and Utah, are the three states which will show the largest percentage.

"The company which I represent has been a pioneer in the development of the agricultural interests of the territory it serves, as well as pioneers in the construction of lines to carry traffic which is produced by that development out of the country. We are with you."

Railroad Rates.

MR. McCOLL (presiding): "Touching railroad matters. Over in Australia when we are holding a Congress such as this—we meet, not to study dry farming, but to study agricultural matters generally—the railroads, upon any delegate presenting his authority from the secretary of the Congress, allows the delegate to travel from his home to the Congress and back, at half fare. Now I would like to see the railroads do that here. I hope I will be pardoned in making that statement."

MR. BIDWILL: "We have laws in this country which are different from those of your country."

WYOMING.

Prof. J. D. Towar, director of the State Experiment Station, University of Wyoming, spoke as follows:

"I want to congratulate this audience on being able to withstand so many dry farmer speeches. I promise you I am going to give you a little diversion this afternoon. I want to say a word or two to the irrigationists. I think in all the speeches that have been made and in all that are to follow on the program there is scarcely a word of interest to the irrigation farmer, and I have chosen for a very brief talk a few words in regard to dry farming principles as applied to irrigation practices.

Dry Farming and Irrigation.

"The fundamental principles of dry farming consists in agricultural practices which will tend to conserve soil moisture and make the very most for cultivated crops of a limited supply of rainfall. While the so-called systems of dry farming are supposed to be practiced in the semi-arid regions only, it has been found by actual practice and scientific experiments that the dry farmer's methods apply with equal force to the farmer who is growing crops in those sections which are assumed to have regularly a sufficient amount of rainfall.

Method Useful Everywhere.

"The potato grower in New England, the orchardist in New York and Michigan, the corn growers in the great corn belt of the Middle West, and, in fact, all who till the soil must respect the practices of the dry farmer, for they cannot hope to secure the largest return from their land and their labor without employing religiously and thoroughly the principles of moisture conservation as laid down by the advocates of dry farming.

Protection from Drouth.

"There is no part of the Middle West where the annual precipitation is 30 inches and above which does not at some time of the year or at frequent seasons suffer severe loss by reason of long and protracted drouths, and these farmers have learned that by employing the principles of moisture conservation as laid down in the principles of tillage which we are practicing in the semi-arid West, they can defeat the attacks of these dry spells, which, in the past, have wrought ruin and destruction to so many of their crops. Indeed, it is a common observation among the farmers of the humid sections that the supply of moisture for certain periods of the year is much better for the crops if obtained from the conserved moisture of the soil rather than from the renewed and excessive supplies from summer rains.

Improved Quality.

"The quality of corn, potatoes, and many of the cereal grains is vastly better where less rain is obtained and the moisture supplied through the agency of proper cultivation.

"We are all aware of the fact that the only obstacle in the way of further development of much of the inter-mountain country is due to the lack of water. Our irrigation engineers are devising plans to appropriate, by means of immense reservoirs, cement canals, and other expensive works, all of the water that falls on the higher levels for irrigating the greatest possible amount of these western lands.

Irrigation.

"The time is not far distant when, at the present rate of water distribution, our entire supply will be allotted. It is the opinion of all intelligent water-users as well as the result of experiments which have been carefully made, that the average irrigator uses far too much water, and that under the present basis of water distribution the irrigable areas can be vastly increased.

Auxiliary Irrigation.

"If profitable crops can be grown by dry farming methods, using only the annual precipitation, it is reasonable that for adjacent lands, where an artificial supply of water is used, by the application of the dry farming principles, a very small amount of irrigation water will suffice to grow the maximum crop.

"There is no place which demonstrates the truth of the above statement so plainly as on the irrigated meadows, where in the past an unlimited supply of water has been available and has been used. In order to present more concisely the statement made, we will refer to some of the principles of arid land agriculture, and not their application to irrigation farming.

Deep Plowing.

"One of the foundation principles of arid land farming is that the soil must be stirred to a much greater depth than is the custom in the districts favored with an abundant rainfall. It is sufficient to state that deep plowing is generally advisable and that for the irrigationist the preparing for a larger volume of soil for the use of growing crops by means of deep plowing is as important and will result in increasing the yield in the same measure that the farmer on the Isles of Jersey can raise 800 bushels of potatoes to the acre through plowing his land to the depth of 14 inches. There are other reasons why deep plowing will benefit the irrigation farmer. By increasing the reservoirs for irrigation water, he provides all the advantages of a decrease in the number of times he will be obliged to irrigate his crop. It is a well known fact that each time a crop arrives at a condition when it needs irrigation, there is a certain check in growth, and with the application of fresh cold water, and the continued cooling of the soil through evaporation, the growth is temporarily suspended.

Fall Plowing.

"It is universally conceded by all who have studied carefully the systems of dry farming that fall plowed land will produce larger crops the succeeding year than spring plowed land. The weathering and freezing of the upturned soil—benefits which accrue from the practice of fall plowing in the humid districts, the exact nature of which is not fully understood—evidently has a bearing on the growing of crops on irrigated land. At the Wyoming Experiment Station the average of two experiments tried last year to compare fall with spring plowing on irrigated land, gave an increase in the crop of 20.5 per cent. We are all agreed that rain water and melted snow usually bring to the soil elements of fertility and conditions which seem to favor plant growth; that the old adage that 'A coating of snow is as good as a coating of manure,' holds true with irrigated land as well as other soils, and the fall plowed land left rough will have a tendency to utilize, through more rapid melting and holding of greater quantity of snow from drifting, a larger quantity of water than would otherwise be conserved for the land on which it falls. All of the advantages of fall plowing, such as forwarding the work in the spring and permitting of early planting, as well as providing a better physical condition of the soil, will apply to the irrigator as well as to the dry farmer.

Sub-Surface Packer.

"With the exceptions of soils which are very heavy and more or less devoid of humus, there is a universal belief in the use of the land roller. The dry farmer's sub-surface packer is nothing more nor less than an improved roller, and there are few places in any kind of agricultural practice where the sub-surface packer, if sufficiently weighted, would not be an improvement upon the old fashioned roller inasmuch as it packs the ground and tends to re-unite the furrow slices with the subsoil beneath, at the same time leaving a roughened surface, which is important in the cultivation of soils for whatever purpose. The corrugated roller, or any implement which will serve to pack the soil and at the same time leave it rough, is one of the valuable implements of modern agricultural practice, and the irrigator will do well to add this to his list of farm machinery.

The Press Drill.

"All of the points in favor of this implement for seeding on dry land apply with equal force to the irrigationist. The compacting of the soil about the seed prevents the wind from uncovering the seed and provides a degree of solidity in the soil next to the germ which promotes prompt growth and a healthy condition.

Surface Mulch.

"While all the other principles enumerated have an important bearon the practices which will insure success to the arid land farmer, the great principle on which the entire matter is based is that of preventing the escape of moisture through the agency of a layer of loose soil maintained at the surface of the ground on all cultivated crops as well as cereal grains wherever the plan may be exercised. The surface mulch serves as a blanket to prevent the escape of moisture through evaporation, and if the dry farmer can conserve for months the moisture which is in the soil and present it to his growing crop laden with the elements of fertility made soluble and assimilable through chemical and bacterial actions carried on during this period of conservation, it is reasonable to decide that the supply of moisture provided by irrigation may also be conserved through the surface mulch and its value increased through continued association in the soil with the forces which make soil fertility available. Furthermore, if through cultivation the quantity of water to be applied can be decreased, indirect results of benefit to the soil may be secured. As a general rule, the water of irrigation is colder than the soil to which it is applied, and with each application of the cold water, the temperature of the soil is reduced to nearly that of the water applied, thus checking the growth and even stopping it entirely for a short period. The soil is further cooled through the evaporation at the surface of water thus applied.

Sub-Irrigation.

"It is generally conceded that the benefits of sub-irrigation are due very largely to the fact that this method eliminates the cooling effect of surface irrigation. The irrigator, after water has been once applied, will find that his soil has been encrusted, and here again he must apply the practice of the dry farmer, who cultivates immediately after each fall of rain to restore his blanket of protecting mulch.

Cultivating Growing Crops

"It is one of the more progressive ideas in dry land farming that cereal crops, such as wheat, oats and barley, should be cultivated even after the crop has attained considerable height. This cultivation tends to destroy weeds and serves its primary purpose of preventing the escape of moisture. The quality and yield of many of the cereal crops are often seriously injured through the mis-application of water at critical periods in the growth of the crop. As a rule, cultivation with the light harrow or weeder will serve the same purpose as one irrigation, and the benefits derived therefrom will be equal to the water application, and will ward off the dangers which follow the application of irrigation water at a delicate period in the growth of the cereal crop.

Permanent Meadows.

"The dry land farmer has found that fields of alfalfa, brome grass, and other perennial crops are greatly benefited through the practice of thorough cultivation, such as disking or harrowing with sword tooth harrows. This operation serves to create a surface mulch, to disorganize the sod-bound condition that often maintains, and at the same time to provide a means of ventilating the soil.

Soil Treatment.

"While the irrigation farmer may apply water and thus compensate for the lack of moisture suffered by the dry farmer, he can obtain equally valuable results by the application of the cultivation methods employed by the dry land farmer. The trouble is not always a lack of moisture which the irrigationist usually believes in, but the fact that

Soil Renovation.

the soil needs tillage and a renovation which will promote chemical and bacterial action and at the same time aid in the introduction and circulation of air. The permanent meadows of the irrigator can be materially improved through the exercise of cultivation methods.

Irrigationist Should Study.

"The irrigationist has been prone to look upon the dry farmer with derision and pity. The fact that the irrigation farmer has at his command the one element, water does not prove that he has mastered all of the demands of a growing crop when he supplies this single element and depends upon nature without the exercise of intelligence to supply what else is needed. The providing of the best physical condition for the growing crop, the supplying of air and warmth and sunlight, are matters which demand the attention of everyone who cultivates the land.

Fertilization and Rotation.

"The farmer in the humid regions realizes this fact, and exhausts every possible means of maintaining his fertility through the application in the best possible manner of all the stable manures produced on the farm, by practicing the rotation of crops, whereby the lagumes may be grown and advantage taken of their ability to assimilate atmospheric nitrogen, and by practicing systems of cultivation to insure the greatest amount of good from the supply of water at hand, provide a constantly renewed supply of air, and take advantage of all the forces of nature to insure warmth and sunlight for his crops. There can be nothing in these principles which the irrigation farmer has any reason to overlook, and they are the foundation principles of dry land farming."

WYOMING.

Dr. V. T. Cooke, state director of dry farming experiments, of Wyoming, addressed the Congress as follows:

"Our Chairman made a remark yesterday that he thought we ought to confine ourselves to facts, and in my address I want to assure you that all the things I may say are absolute facts, and you do not have to believe, but you can have my talk verified at any and all times.

"Dry Farming" Is Misnomer.

"We are unfortunate, at least I begin to think so, in our term, or use of the words, 'dry farming.' They are very misleading and certainly give many the wrong impression, because some people get the idea that we can raise grasses and grains without or almost without that vital necessity to all vegetation, moisture. On the other hand, if we use the term 'arid agriculture,' the word arid, is misleading too, because aridity conveys the idea of desert. It is more than likely that the words 'dry farming' will stay with us and we hope through such educational movements as this Congress we will secure a better understanding of the words so that everyone concerned will know that the term, dry farming, means raising crops with the natural precipitation and that no artificial application of water to the soil is meant.

Growth of Movement.

"If anyone had mentioned the possibilities of such a gathering as this, a few years ago, in any part of the United States, let alone Wyoming, there would have been no question of doubt in the minds of those who heard the assertion, that the speaker was either an enthusiast who did not know what he was talking about, or was at least over-balanced. 'Tis so always, and no doubt always will be, for all time, that the more important and valuable the work, the more skeptical and unbelieving we are. Take any of the most important improvements and inventions in the world and the inventor, as a rule, has had the fight of his life to make anyone take the same view of his proposition as he had.

Prejudice Exists.

"So it is with dry farming in Wyoming because; first, many people having had things their own way and being accustomed to the same, don't want a change; second, a great many people express the opinion that this talk of raising crops in Wyoming is all nonsense. Having been raised in the state and seldom having seen the outside of it during their lives, what they don't know of Wyoming is not worth talking about. The fact is the best classically educated man is practically an ignoramus unless he has traveled. And it is easy to understand that some of us who have not had the opportunity to travel and perhaps have not read any too much good literature are very much inclined not to take stock in any apparently radical change from present conditions.

Wyoming Results.

"But let us look into this matter a little more. In 1905 when I first visited Cheyenne and looked into the possibilities of so-called dry farming,—studied the problem before me,—and after seriously considering the matter I believed crops could be raised in the vicinity of Cheyenne

Bi-enniel Cropping.

by proper methods, of cultivation and conservation of moisture,—two years' moisture for one big crop. Nearly everyone laughed at me, perhaps not in my face,—Wyoming people are too courteous for that,—but certainly behind my back. This opportunity of getting the best of this dry farm crank was too good a one to be lost.

First Experiment.

"Arrangements were made so that I had the opportunity of proving, if possible, my assertions. I was not given the privilege of choosing a piece of ground that was ideal for receiving and holding moisture or even to make the demonstration where if the crop failed, no one would see it, but my first crop was raised on what was then in the enclosure of the park, where the frontier show was held, almost within the city limits and where everyone attending the greatest show of its kind, must necessarily see the crop of grain. The crop was a success, 38 2-3 bushels of macaroni wheat per acre, beardless barley, 56 bushels per acre, oats not computed on account of smut. The crop was a surprise to almost everyone. The success was due, so some said, to an exceptionally wet season.

Precipitation.

'The government records show 17.65 inches of rain for 1906. But in 1907 I raised good crops one and a half miles east of Cheyenne and demonstrated to everyone willing to visit my farm that season, the great difference between conserving the moisture which fell the previous year and utilizing it, the following season, and growing a crop with one year's moisture. The soil was plowed six inches deep in the spring, harrowed and seeded and left to depend upon what moisture fell that season for making its crop. In 1907 the precipitation January 1st to July 1st, six months, was 5.75 inches (.34 inches in June). The crop sown, oats and barley did, not begin to compare with those sown on ground summer-tilled the previous season and were in fact all but a failure.

Soil Treatment.

"My winter grain crop of 1908, I think I may say, was a revelation to all of us—certainly it was to me. This crop was on sod ground plowed five or six inches deep in the fall of 1906, with a steam plow, four gang, 24 discs. It was not plowed very well because the ground was so dry. In the spring of 1907 this land was cross plowed with a mold board plow and disked and harrowed with a steel drag harrow.

Seeding Methods.

"Thirteen acres were sown with Turkey Red winter wheat, and two acres with winter rye. I also planted Turked Red wheat on 17.3 acres of sod soil which had been plowed twice in 1907 and harrowed with a disc and steel drag. The above was sown with a double disc drill beginning September 15, 1907.

Precipitation.

"From September, 1907, to the beginning of May, 1908, there was only a precipitation of 1.5 inches, for practically eight months. The elevation is 6,060 feet. Prof. B. C. Buffum, who had been in charge of the agricultural department of the Wyoming University for fifteen years, visited my crops in the spring and after we had thoroughly examined the wheat and rye, alfalfa and brome grass fields, turned to me and said he was very much disappointed. When I asked why, he replied: 'All of your crops ought to be dead and they are not.'

Average Results.

"'Twas true these crops were very much alive. I threshed 44.5 bushels of rye and a little over 35 bushels of wheat per acre. My experience in raising these crops and various others, such as spring wheat, oats, barley, emmer (commonly called spelts), Canadian field peas, potatoes, millet and kaffir corn prove to me beyond any doubt, that if proper methods of farming are carried out, to conserve all moisture that is precipitated, we can raise good paying crops in most parts of Wyoming where vegetation grows.

Forage Crops.

"It is my opinion that it is most fortunate for Wyoming that dry farming has proven successful, inasmuch, as I am convinced the stockmen now realize that for their business to be conducted on a safe basis, they must supplement their winter range with feed; conservative banks no longer loan money to the man who depends entirely on the range. This I think is not a case of choice but is one of necessity and even if it were true that we could not ripen cereals, we can raise all kinds of fodder. This in itself means more stock and certainly better stock and better care. The dry farmer will raise the crops for the stockmen. Our sheepmen have fed many carloads of corn to sheep on the range this winter, paying as high as $1.40 per cwt. for it. Those who could reach a farming section with their flocks to rough them through on hay or in the fields have been fortunate. The production of winter stock feed at home is of paramount importance to the rangemen.

Bi-enniel Cropping.

"Men ridicule the idea of raising crops in this state without irrigation, but I here assert that with what moisture falls we can conserve enough to raise one big crop every other year and more often can raise two crops in three years. It is and has often been asserted that during the last three years we have had an unusual amount of moisture.

Precipitation.

"This is partly true and partly untrue. In 1906 the precipitation was 17.65 inches. In 1907 it was 12.34 inches. In 1908 it was 19.09 inches. The winter and spring of 1907 and 1908 were unusually dry, according to the government farm records,—1½ inches for eight months,—and from May until September 1, we in a sense, had too much moisture, 15.49 inches.

Climate Helps.

"I believe there are factors in Wyoming, of which we know very little, in the climatic conditions, which seem to very materially help us in raising crops. Once more I wish to mention Prof. Buffum. He is interested in a seed breeding farm, as some of you know, at Worland, in the Big Horn basin. The precipitation there is about 5.5 inches per annum. In the fall of 1907 he planted some winter rye.

Dry Farm Rye.

"Last spring he wrote me that the rye was looking fine but the soil was as dry as the ashes of hell. This rye was sown under the ditch, with the expectation of getting water from the same, but the ditch not being completed at that time the crop had to do without irrigation, hence his writing the way he did. This rye lived through the winter with no rain or snow at all and When I visited it, the tallest straw was even with the top of my head.

"Here are two instances, one in which crops produced practically maximum yields after a most unusual drouth of eight months and another 300 miles north where the elevation is about 4,000 feet and the rye lived under supposedly impossible conditions.

Dry Farming Not New.

"Since my advent in this state, there has been brought to light the fact that dry farming is and has been successfully carried on for the past 15 to 20 years in various parts of the state, but I want to direct your attention to a very important point in connection with some of these farmers. A great many of them have raised as high as 50 bushels per acres of oats, year after year without farming, in other words, the grain was sown by hand on the stubble and was either covered with a disc or corn cultivator. What cannot these men do by intelligent up-to-date methods?

Soil Study

"There is another most important matter for the farmers who are with us to consider and that is there are many varieties of soils in Wyoming and the man farming must study his soils as well as general conditions, to be successful. We will have to restore that most important necessity, humus, to some soils earlier than many of us think, if we want to have them in the right conditions to hold moisture. This may be done by plowing under green manures.

Dry Farming and Irrigation.

"Many irrigators are finding out that methods recommended for the dry farmer apply equally well to them and that to get maximum crops, deep plowing, less irrigation and more irritation or cultivation, pays. We know beyond a doubt that we can save moisture in the soil and that we are obtaining grains and grasses which are adapted to our climatic conditions. Another great help to our crops is that about 75 per cent. of our precipitation comes from April 1, to September 30, just when vegetation needs it.

"When we of Wyoming look upon those great states west of us and see what they are doing in the matter of dry farming, we cannot understand why we connot do equally well if not better. No doubt there are problems to be solved in some parts of our state but who ever heard of an American but what could and would stick to his proposition and win out, if he could see a glimmer of light ahead of him. We must cut out the word, 'can't,' seriously study our conditions and recollect that only a few years ago this state was part of what was known as the Great American Desert. Desert no longer because we can and will prove to the whole world that by utilizing our intelligence and opportunities we can use our fertile lands for what no doubt they were intended, and that is, to support a part of our great nation. History repeats itself. State after state has gone through practically what Wyoming is now undergoing. Men came and went away, but some stayed and won out. Many will fail. You will find this true wherever you go and in all classes of life and business.

Precipitation.

"To the intelligent farmer with some capital, Wyoming offers opportunities unsurpassed. The government records of the weather bureau of Cheyenne show that our average precipitation for 37 years is 13.55 inches, with the understanding that the records of the early part of the period were not very accurate and the average for the last 15 years is 16.02 inches. 'Tis true our moisture comes rather erratically, too much at times, and not enough at others, but by persistent, intelligent use of brawn and brain we can conserve sufficient moisture and so use it that we will raise big paying crops."

DRY LAND AGRICULTURAL INVESTIGATION.

By Prof. E. C. Chilcott, in Charge of Dry Land Culture, Department of Agriculture, Washington, D. C.:

(The last section of Prof. Chilcott's address was illustrated by Stereoptican.)

"I will endeavor to take up very little of the time of the Congress, as I merely wish to introduce some of the phases of our Dry Land Agriculture investigations that will be discussed at greater length by Dr. L. J. Briggs, the Physicist of our Bureau, who is associated with me in all of these investigations.

"I will take this occasion to assure the members of this Congress that all the men who are associated with me in Dry Land Agriculture investigations, together with myself, are enthusiastic supporters of the objects for which this organization stands. We believe that there are vast agricultural resources which can and will be developed by the application of scientific principles to the practice of agriculture in the semi-arid regions of this counry. We want to aid in the most effectual way in this development. We believe that in the present stage of the development of dry land farming we can best serve the cause by pointing out some of the difficulties to be met in the solution of these problems,

Danger in Generalization.

and the great danger that lies in attempting to make broad generalizations based upon limited experience in a single locality—or at best a few localities—with a certain soil type and a certain combinaton of climatic factors. We are heartily in sympathy with the policy of this Congress, which gives an opportuniy for any one who has worked out a plan which has given good results on his own farm, to give others the benefit of his experience.

Value of Congress.

"We realize that immense good must come from this free exchange of ideas and experiences. We have no disposition to minimize the importance of individual experience. On the contrary, we realize that it is from such cumulative experiences alone that we can hope for a solution of these complex problems. It is upon just such individual experience that we depend to guide us in arriving at correct conclusions regarding the effect of various agricultural practices in Dry Land Agriculture.

Government Co-Operation.

"Our organization within the Department of Agriculture and our co-operation with the various State Experiment Stations enable us to bring to bear upon these problems a large corps of specialists trained along the lines of agronomy, physics, meteorology, bacteriology, chemistry and plant physiology, who carry on thoroughly co-ordinated observations and experiments at many points, distributed over a large area, and without interruption from year to year. Owing to this plan of organization, which gives us the benefit of not only the knowledge possessed by the specialists within this Department, but also of those connected with the several co-operating State Experiment Stations, we have already amassed data concerning methods and results of dry land farming far exceeding that in the possession of any other individual or organization.

Experiment Stations.

Acreage Yields.

"For instance, the diagrams which I am about to exhibit, while they represent but a very small fraction of the results obtained in our investigations, show the yields obtained from one hundred and ninety-four plats of oats, grown as follows:

"Oats on fall plowed land after wheat, 33; spring plowed land, after wheat, 16; fall plowed land, after oats, 10; spring plowed land, after oats, 10; fall plowed land, after barley, 11; fall plowed land, after flax, 5; spring plowed land, after corn, 22; disced land, after corn, 34; after peas, plowed under for green manure, 11; after rye, plowed under for green manure, 10; after sweet clover, plowed under, 6; after fallow or summer tilled land, 26; total, 194.

"One hundred and sixty-four plats grown as follows:

"Wheat on fall plowed land, after wheat, 10; spring plowed land, after wheat, 10. fall plowed land, after oats, 21; spring plowed land, after oats, 10; fall plowed land, after corn, 12; Spring plowed land. after corn, 10; disced land, after corn, 51; after peas, plowed under for green manure, 7; after rye, plowed under for green manure, 7; after sweet clover, plowed under, 6; after fallow or summer tilled land, 20; total, 164.

Experiment Stations.

"As these crops were grown at six different stations, as will be shown on diagrams, they represent results on six distinct soil types. And as three years' results were obtained at one and two years' results at each of two other of these six stations, they represent ten distinct sets of meteorological conditions; and further, as very full meteorological observations were taken and the resulting physical conditions of the soil were determined, as will be shown by Dr. Briggs, I think it will readily be granted that we here have vastly more reliable data upon this subject that have ever been brought together before.

"Such being the case, we ought to be in a position to draw more definite and positive conclusions than anyone else concerning the best methods of dry farming, and I believe we are. What, then, are these conclusions?

"Briefly, our conclusions are:

Danger in Generalization.

"That vastly more data than we yet possess must be gathered before anyone will be warranted in making any broad and sweeping generalizations concerning methods and systems of dry land agriculture, such as are so freely made by a certain class of popular writers who have little or no experimental results upon which to base their assertions. We have demonstrated beyond a question that very few of the hard and fast rules, so confidently laid down by this class of writers are of such universal application as they claim. As will be shown by the diagrams, the methods which give most satisfactory results one year, will sometimes fail completely to give the same results another year on identically the same soil. And that what will bring good results at one station will fail utterly to give like results at another station, even when climatic conditions are similar.

Soil Treatment.

"In some localities upon a certain type of soil, spring plowing will generally give better results than fall plowing. In other localities with another type of soil, fall plowing will generally give better results than spring plowing. But even these are only very general rules, for we find that the comparative merits of fall and spring plowing are frequently reversed at the same station on identically the same kind of soil, under slightly different climatic conditions.

Summer Fallow.

"Alternate cropping and summer tillage will generally give better results than continuous cropping, but there are exceptions to this rule.

Soil Fertilization.

"The plowing under of green manure will generally give better results than summer tillage, but not always. A proper system of crop rotation will generally give better results than continuous cropping, but even this rule is not of universal application, as will be seen from the diagrams which we are about to examine. Thus we might continue until we had shown the utter futility of attempting to formulate any set of rules for dry land farming that would be of universal application.

"What would be 'good farming' on one type of soil, subject to one set of climatic conditions, might be 'poor farming' if either the soil type or the climatic conditions were changed. What seems to be the best of 'good farming' in the preparation of the seed bed and the planting and early cultivation of the crop may bring disastrous results later in the season.

Causes of Failure.

"For instance, over-stimulation of plants during the early stages of their growth may induce such a luxuriant vegetative growth accompanied by a superficial root development that they will become much less able to contend with drouthy conditions than are plants which have had less favorable soil conditions during the early growing stages, should such drouthy condtions occur about the time the grain is filling. The same is true as regards resistance to cold and to disease. May and June frosts usually injure good fields of grain more than they do poorer fields, and it is not an uncommon experience to see those portions of a field of wheat or oats, having the most luxuriant growth, almost completely destroyed by rust while the poorer parts of the field escape. Hot winds sometimes injure rank growing vegetation to a greater extent than they do where it is less luxuriant. Hail will destroy a good crop as effectually as it will a poor one. What is generally considered 'poor farming' sometimes yields more profits—or less loss, as the case may be—than so-called 'good farming.' These are facts familiar to everybody who has had experience in farming in the semi-arid regions.

"Shall we then cease to strive to improve our agricultural methods simply because we know we will sometimes fail? By no means! We know that there are very few rules of any kind that do not have their exceptions. The more general the rule the more exceptions there are likely to be when an effort is made to apply it to particular cases. This is especially true when we attempt to generalize concerning methods of dry farming where there are so many unknown factors and so many unforseen combinations both known and unknown, modifiable and unmodifiable, factors.

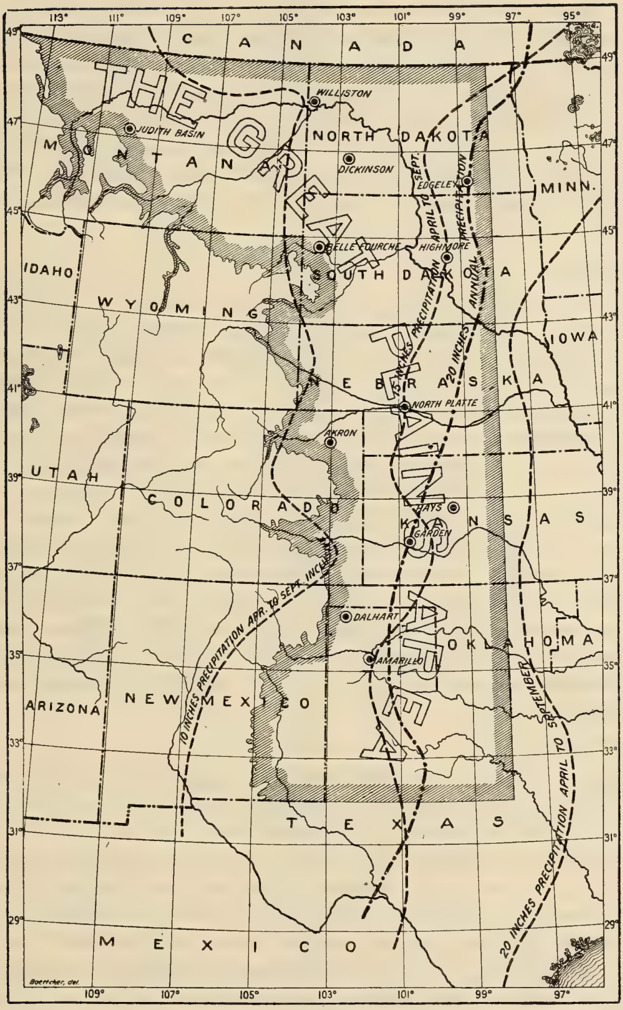
"Let us then keep on experimenting and observing with open minds, exchanging ideas and experiences, frankly admitting our failures, and not boasting over much of our successes, but carefully analyzing both our failures and successes, in order that we may if possible, get at the underlying principles that govern both. And above all, let us strive to keep out their prescriptions warranted to cure any and all ailments at so much per.

Study Local Conditions.

"This seems to be a very attractive and profitable field for some, but it is likely, if the first dose does not sicken the farmers, to develop a 'peruna appetite' among them instead of curing their ailments. If we are to benefit the farmers, it must be by stimulating in them a tendency to investigate and to reason for themselves, rather than to depend upon following any set of ironclad rules laid down for them.

"The foregoing statements and conclusions are based upon data secured at six of the stations in the Great Plains Area.

DIAGRAM NUMBER ONE.



Precipitation.

"Diagram number one represents the Great Plains Area and shows the location of the eleven stations where dry land agriculture investigations are now being carried on. It also shows the line of 20 inches annual rainfall and also three lines representing 10 inches, 15 inches and 20 inches, respectively, of rainfall occurring from April 1st to September 30th, inclusive.

Experimental Stations.

"The reason for the selection of six of these stations and the exclusion of the other five is that the work at only six of them had progressed far enough to give results that can be considered in this connection. The six stations having been in operation for periods varying from three to five years, the results have been used in the accompanying diagrams. As the results of crop sequence do not become apparent until the second year, but a single year's results are available from Dickinson, Hays and Amarillo, two years' results from Edgley and North Platte, and three years' results from Highmore.

Wheat and Oats.

"A considerable number of crops were raised at each of these stations, but it was considered desirable to confine this discussion to two of the principle crops. We have, thereore, selected wheat and oats for this purpose. All of the yields from the plats raising these crops at all six of these stations for the time covered have been used, except in a few cases where, due to error or accident of some kind, the results were known to be inaccurate, and, therefore, not comparable with other results given. No effort whatever has been made to obtain evidence for the support of any theory or hypothesis. We have simply brought together all available data having a bearing upon these two crops grown at these six stations. We do not consider this data sufficient to warrant any definite conclusions. We do feel, however, that they are sufficient to show something of the limitations and possibilities of this work when carried on for a sufficient length of time. In the discussion of the following diagrams we will endeavor to point out some of these limitations and possibilities.

Acreage Results.

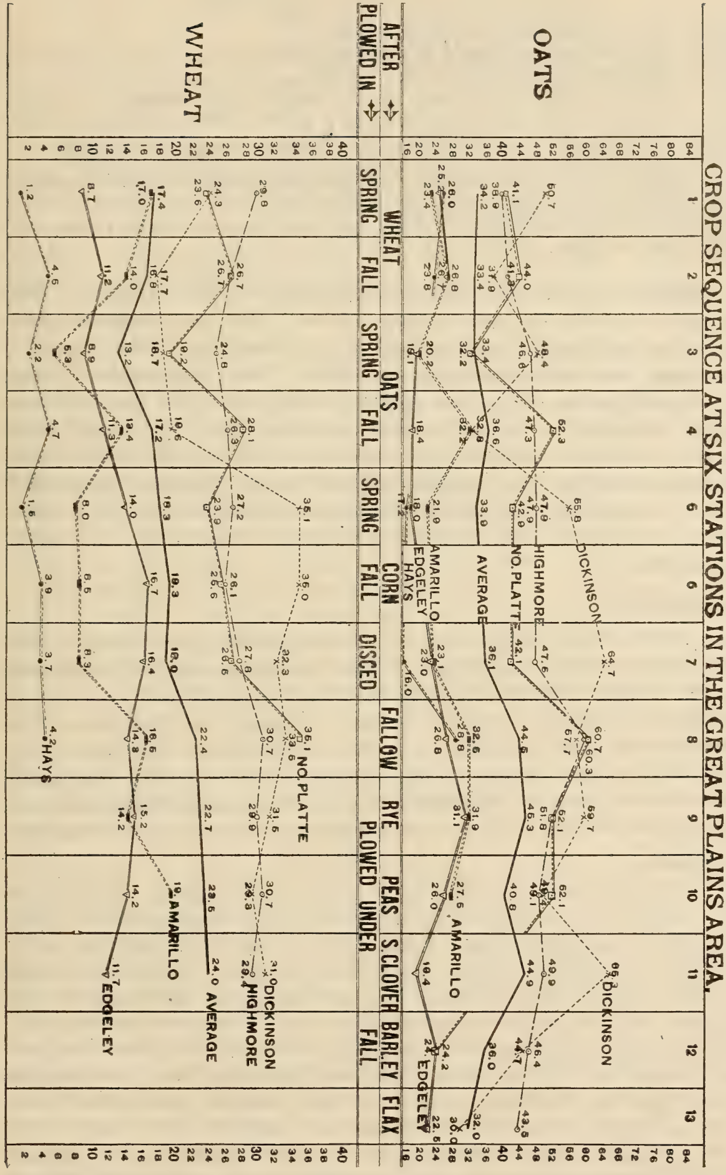
"Diagram number two represents the yields of oats and wheat as affected by soil preparation and crop sequence at the six stations mentioned. The vertical columns numbered from one to thirteen indicate the various crop sequences and times of plowing as is set forth in the legend at the bottom of the diagram. The marginal figures at the right and left sides of the diagram indicate the yields in bushels of oats in the upper half of the diagram and of wheat in the lower half of the diagram. The heavy solid lines crossing the diagram irregularly from right to left indicate the average yields obtained at all of the stations under different crop sequence and times of plowing, the one in the upper half being for oats and the lower half for wheat. The six double or broken lines each represent the yields obtained at one of the six stations, as is indicated by the name affixed to the line.

Crop Rotation.

"Let us first consider the heavy solid line in the upper half of the diagram, which represents the average yield of oats obtained. It will be noticed that on the average there was very little difference in the

DIAGRAM NUMMBER TWO.

YIELDS OF OATS AND WHEAT AS EFFECTED BY SOIL PREPARATION AND CROP SEQUENCE AT SIX STATIONS IN THE GREAT PLAINS AREA.



The upper half of this diagram shows by curves and figures the average yields in bushels, of Oats raised under different systems of rotation and soil preparation at Dickinson, N. D., in 1908; Edgeley, N. D., in 1907 and 1908; Highmore, S. D., in 1906, 1907 and 1908; North Platte, Nebraska, in 1907 and 1908; Hayes, Kansas, in 1908; Amarillo, Texas, in 1908; each curve, representing the station designated by name on the curve, as follows:

Column No.
1. Yield of Oats on spring plowed land after Wheat.
2. Yield of Oats on fall plowed land after Wheat.
3. Yield of Oats on spring plowed land after Oats.
4. Yield of Oats on fall plowed land after Oats.
5. Yield of Oats on spring plowed land after Corn.
6. Blank, no Oats having been grown on fall plowed Corn ground.
7. Yield of Oats on land disked but not plowed after Corn.
8. Yield of Oats on fallow or summer tilled land.
9. Yield of Oats on land which had Rye plowed under for green manure.
10. Yield of Oats on land which had Peas plowed under for green manure.
11. Yield of Oats on land which had Sweet Clover plowed under for green manure.
12. Yield of Oats on fall plowed land after Barley.
13. Yield of Oats on fall plowed land after Flax.

The lower half of this diagram shows the same data for Wheat that the upper half does for Oats.

yields obtained from the oat crop following wheat, either spring or fall plowed, and that following oats spring plowed. The crop obtained from oats following oats on fall plowed land was 3.2 bushels greater than for oats following oats upon spring plowed land. The yield obtained from the oat crop following corn upon spring plowed land, 33.9 bushels, was very nearly the same as that obtained from wheat land. The disked corn land gave an average yield of 36.1 bushels, which was .5 bushels less than the crop obtained from continuous cropping to oats upon fall plowed land. The yield of oats upon fallow or summer tilled land was 44.5 bushels, being 7.9 bushels more than for continuous cropping to oats upon fall plowed land.

Soil Fertilization.

"The yield obtained from the oat crop following rye plowed under for green manure was 45.3 bushels, being 0.8 bushels higher for summer tilled land. Upon land where peas had been plowed under for green manure the yield was 40.8 bushels, being 4.5 bushels less than where rye was plowed under and 3.7 bushels less than for summer tilled land. The yield on land where sweet clover had been plowed under for green manure was 44.9, being 0.5 bushels more than for summer tilled land, and 0.4 bushels less than for land having rye plowed under for green manure.

Crop Rotation.

"The yield of oats following barley upon fall plowed land was 36 bushels, being 0.6 of a bushel of the same yield obtained where oats followed oats. The yield of oats following flax, was 32 bushels per acre, being 1.4 of a bushel less than continuous cropping to oats on spring plowed land. It will thus be seen that averaging all the yields for all the stations for the entire time we find that the highest yields (45.3 bushels), of oats was obtained by plowing under rye for green manure and the lowest yield (32 bushels), from oats following flax. We can see from this that the average results do not indicate that either crop sequence or time of plowing produces any marked effect upon crop yield. It is only when green manure is plowed under or the land is allowed to remain fallow for the preceding year that any marked increase in the crop is noted, and even these increases are too slight to warrant the additional expense of these practices so far as the immediate crop is concerned. There are, however, other reasons why some of these practices should be followed. We will not, however, discuss them at the present time.

Soil Treatment.

"When we come to examine the results obtained at individual stations, we find much more marked differences in the yields obtained in different crop sequences and after different times of plowing. We also find that the same crop sequence and same time of plowing often produce exactly opposite effects at different stations. For instance, take the two stations at Dickinson, North Dakota, and Amarillo, Texas.

Crop Rotation.

"It will be noticed that oats after wheat gave 12.8 bushels more yield after spring plowing than after fall plowing at Dickinson, while at Amarillo the yield from fall plowing was 3.3 bushels greater than for spring plowing. Much the same difference is noted upon the continuous cropping of wheat, the yields being much higher on the spring plowed land at Dickinson than on the fall plowed land, while at Amarillo the difference is in exactly the opposite direction. No crops of oats were raised upon corn land fall plowed, but the corn land spring plowed at Dickinson, gave relatively high yields. 55.8 bushels, while oats upon fall lowed corn land at Amarillo gave 21.9 bushels. It might be noted in this connection that the yields obtained at both of these stations are very nearly the same for continuous cropping with oats, the fall plowed land being 32.2 bushels in one case and 32.3 bushels in the other. The yield of oats on disked corn land at Dickinson was high, being 64.7 bushels, while at Amarillo it was 23.1 bushels. The yield at Dickinson on summer fallowed land was 57.7 bushels, being 7 bushels less than upon disked corn land, while at Amarillo it was 32.5 bushels, being 9.4 bushels greater than upon disked corn land. At Dickinson the yield upon land having had rye plowed under for green manure was two bushels greater than upon fallowed land. While at Amarillo it was six bushels less than upon fallowed land. Peas being plowed under gave 10.3 bushels less than rye plowed under at Dickinson and at Amarillo 4.4 bushels less. At Dickinson the land having had sweet clover plowed under for green manure gave the highest average yield obtained at any station, 65.3 bushels. No oats were grown at Amarillo on land having had clover plowed under. The yield of oats following barley on fall plowed land was 44.7 bushels at Dickinson and 24.2 bushels at Amarillo. Oats after flax was not raised at Amarillo but at Dickinson it gave a yield of 30 bushels, which was 2.3 bushels less than was obtained by continuous cropping to oats.

"We will not attempt to trace the other results through. An examination of the chart will reveal that the effect produced upon the yields by the different crop sequences and times of plowing at North Platte, coinside fairly well with those at Amarillo. The effect from different crop sequences and times of plowing produced at Highmore correspond more closely to the average yields obtained for all of the stations. The results at Edgeley also coinside fairly well with the average, with the principal exception that the yield of oats after sweet clover was relatively considerable less at Edgeley than at any of the other stations where that method has been tried. It is well to bear in mind in this connection that the yields for Highmore represent the average results for three years, at North Platte for two years, and at Edgeley for two years. It is quite probable that if we had two or more year's results from Dickinson and Amarillo that the curves would be smoother and the average results would correspond more nearly to those obtained at the other stations and consequently more nearly with the average. The yields obtained at Hayes were very unsatisfactory and might properly have been omitted from this diagram were it not for the fact that we wished to include all of the available data. The crop was injured by grasshoppers and attacks of rust so that the yields were not dependable.

Average Results.

"We will now consider the lower half of the diagram (Page 145) which indicates the yields of wheat under the same methods of treatment already described for the oat crop. It will be noted that there is a general coincidence between the average curve for wheat and the average curve for oats, the most marked exception being the reduced yields obtained from the wheat crop following oats on spring plowed land, which was only 13.2 bushels as against 17.2 bushels for the wheat crop following oats on fall plowed land. The average yield of 22.4 bushels of wheat upon fallow or summer tilled land shows the difference of 4.4 bushels as compared with the wheat on disked land.

Soil Fertilization.

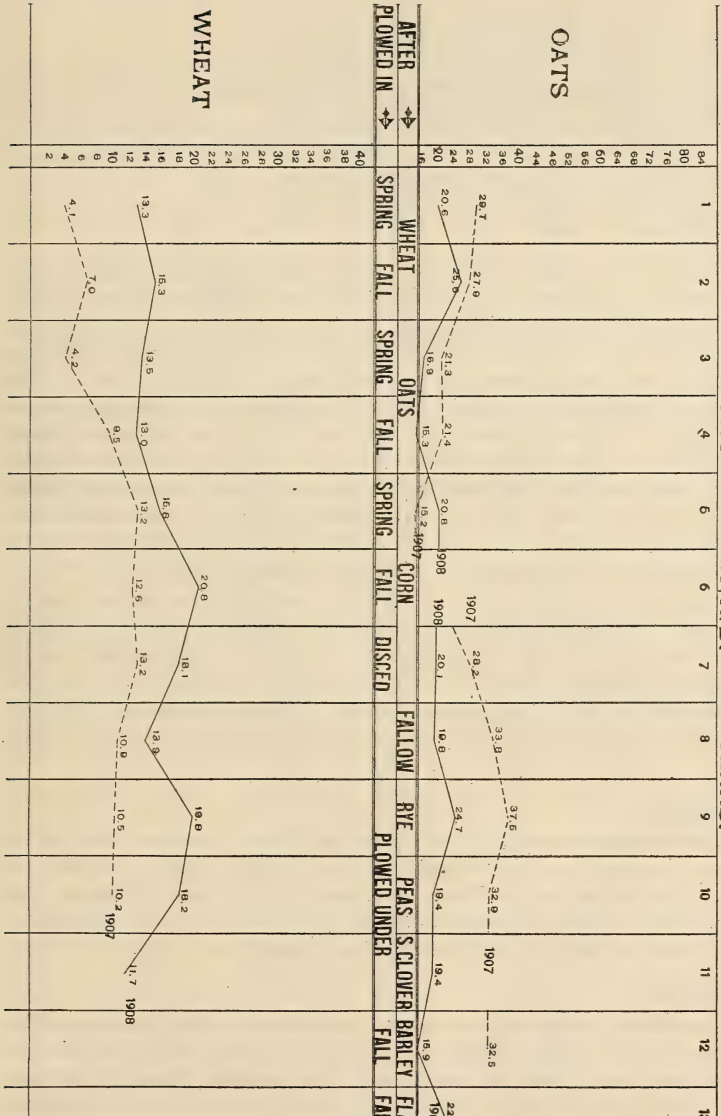
"Plowed under rye, peas and sweet clover all gave better results than summer tilled, the difference, however, being but slight. The results from the several stations correspond more nearly with wheat than with oats. There are, however, many marked exceptions. Amarillo and Dickinson disagree in much the same way with wheat as they did with oats, although not to such a marked extent. Edgeley and Highmore correspond more closely with the average for all the stations. The wheat crop at North Platte seems to have been more susceptible to difference in cultivation than any except Dickinson, but as the results at Dickinson are for only one year while those at North Platte are for two years, the annual effects each year at North Platte are greater than at Dickinson, as will be shown when we come to examine the diagram showing the yields for each year separately.

Wheat and Oats.

"Diagram No. 3 (Page 149), represents the yield of wheat and oats at Edgeley, N. D., for two years, the broken line being for 1907 and the solid line for 1908. It will be noticed that the effect upon the yield of oats due to the different sequences and the time of plowing corresponds very closely for the two years, the only marked exception being that fall plowed oat land gave 6.2 bushels higher yield than spring plowed corn

DIAGRAM NUMMBER THREE.

YIELDS AT EDGELEY, N.D. FOR 2 YEARS.



The upper half of this diagram shows by curves and figures the average yields in bushels, of Oats raised under different systems of rotation and soil preparation at Edgeley, North Dakota, in 1907 and 1908; each curve representing the year designated on curve, as follows:

Column No.

1. Yield of Oats on spring plowed land after Wheat.

2. Yield of Oats on fall plowed land after Wheat.
3. Yield of Oats on spring plowed land after Oats.
4. Yield of Oats on fall plowed land after Oats.
5. Yield of Oats on spring plowed land after Corn.
6. Blank, no Oats having been grown on fall plowed Corn ground.
7. Yield of Oats on land disked but not plowed after Corn.
8. Yield of Oats on fallow or summer tilled land.
9. Yield of Oats on land which had Rye plowed under for green manure.
10. Yield of Oats on land which had Peas plowed under for green manure.
11. Yield of Oats on land which had Sweet Clover plowed under for green manure.
12. Yield of Oats on fall plowed land after Barley.
13 Yield of Oats on fall plowed land after Flax.

The lower half of this diagram shows the same data for Wheat that the upper half does for Oats.

land in 1907, while spring plowed corn land gave 5.3 bushels more than fall plowed oat land for 1908. The only marked exception in the yield of wheat was that fall plowed corn land gave 0.6 bushels less than spring plowed corn land in 1907, while in 1908 the fall plowed corn land gave 5 bushels more than spring plowed corn land. It will also be noticed that the difference between fall and spring plowed oat land was much greater for 1907 than for 1908, and also that while rye and peas plowed under for green manure gave much better results in 1908 than summer fallow in 1908, in 1907, the results for summer fallow, rye plowed under and peas plowed under, were all very nearly the same. One of the most striking results in the wheat yields at this station is the utter failure of summer fallow to produce any marked increase in the yield.

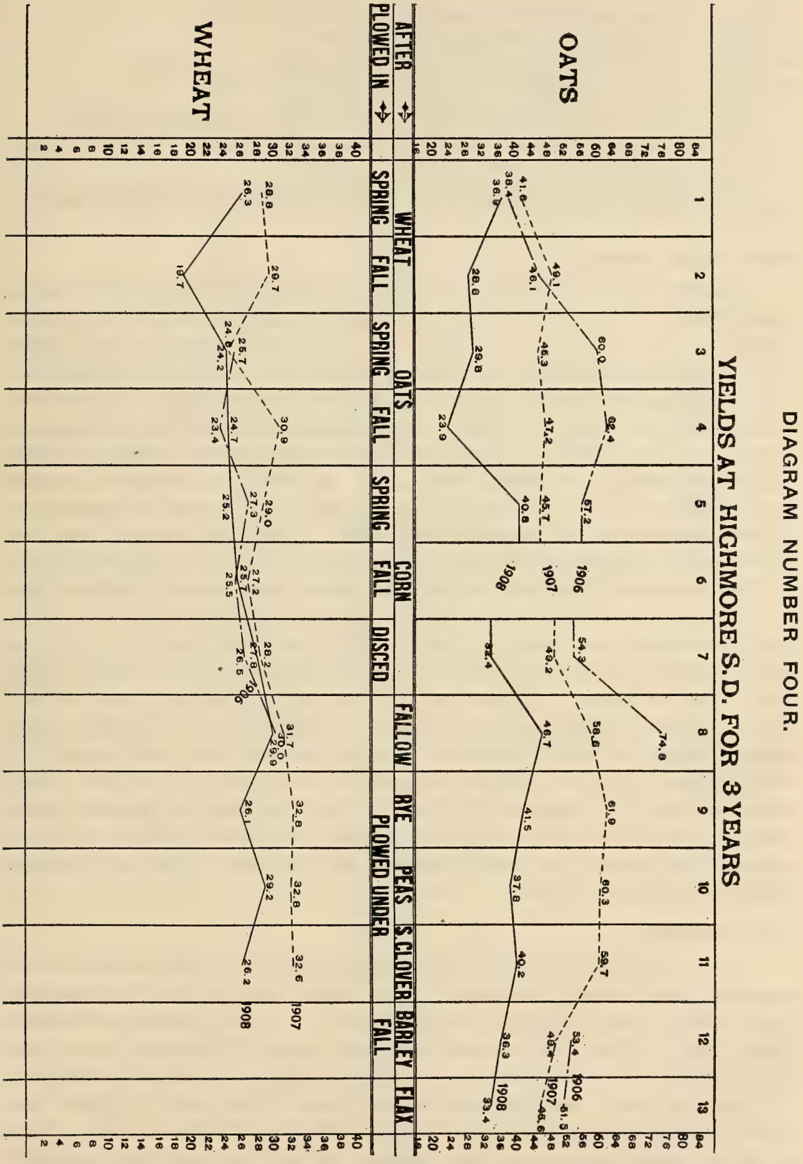
"Diagram No. 4 (Page 151), gives the results of three years at Highmore, S. D. The broken line represents the results for 1906, the dotted line for 1908 and the solid line for 1908. It will be noticed that the results of the different times of plowing and crop sequence in the first five columns for oats show almost exactly opposite results for 1906 and 1908, while the results for 1907 are roughly intermediate between these two.

Soil Irrigation.

"The rotations containing rye, peas and sweet clover, plowed under for green manure were not started in time to give results for 1906 but for 1907 the yields for rye, peas and sweet clover, are all larger than for fallow land, while in 1908 the yield on fallow land was appreciably greater than for any of the green manured plats.

Soil Treatment.

"The wheat yields for the three years at this station agree more closely than do the other yields for the several years. It will be noticed that in both the wheat and oat yields the relative effect of fall and spring plowing following the wheat crop were reversed when a comparison is made of the results for 1907 and 1908. The yields of wheat on the summer tilled plats are remarkably uniform for the past three years, being 29.9, 30, and 31.7 bushels, respectively. In 1907 the green manured plats gave a slightly greater yield than the summer tilled plat, while in 1908 the summer tilled plat was slightly more than the green manured plat.



The upper half of this diagram shows by curves and figures the average yields in bushels, of Oats raised under different systems of rotation and soil preparation at Highmore, South Dakota, 1906, 1907 and 1908; each curve representing the year designated on curve, as follows:

Column No.
1. Yield of Oats on spring plowed land after Wheat.
2. Yield of Oats on fall plowed land after Wheat.

3. Yield of Oats on spring plowed land after Oats.
4. Yield of Oats on fall plowed land after Oats.
5. Yield of Oats on spring plowed land after Corn.
6. Blank, no Oats having been grown on fall plowed Corn ground.
7. Yield of Oats on land disked but not plowed after Corn.
8. Yield of Oats on fallow or summer tilled land.
9. Yield of Oats on land which had Rye plowed under for green manure.
10. Yield of Oats on land which had Peas plowed under for green manure.
11. Yield of Oats on land which had Sweet Clover plowed under for green manure.
12. Yield of Oats on fall plowed land after Barley.
13. Yield of Oats on fall plowed land after Flax.

The lower half of this diagram shows the same data for Wheat that the upper half does for Oats.

North Platte Station.

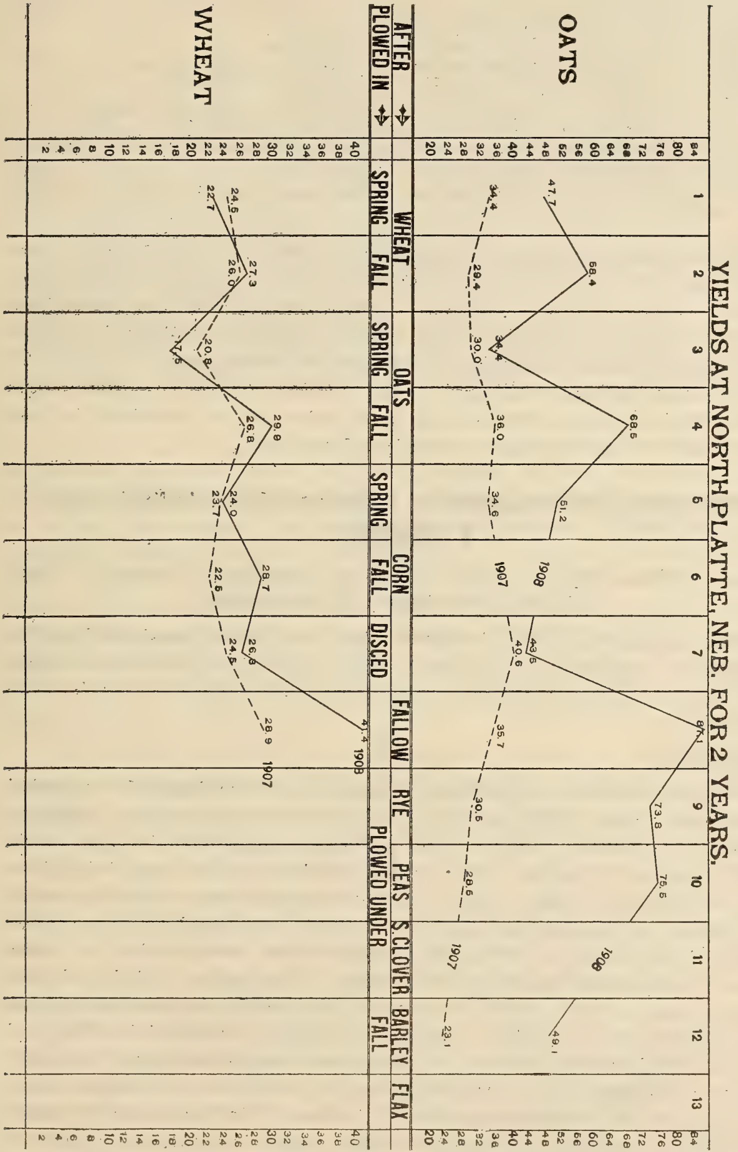
"Diagram No. 5 (Page 153), represents the yields of wheat and oats at North Platte, Neb., for the years 1907 and 1908, the broken line being the yields for 1907 and the solid line for 1908. The results of the different sequence and time of plowing upon the oat crop of 1907 was not at all striking, the highest yield, 40.6 bushels, having been obtained from the disked corn plat, the fallow plat giving 4.9 bushels less than the disked corn plat. Both rye and peas plowed under were less than either the fallow plat or the disked corn plat. In 1908 very different results were obtained. In fact, there is almost a complete reversal of the effects of crop sequences as compared with 1907. It will be noticed that fall plowed wheat land gave 10.4 bushels more than spring plowed wheat land in 1908, while in 1907 the fall plowed wheat land gave 5 bushels less than the spring plowed wheat land. In 1908 the spring plowed oat land gave 24 bushels less than the fall plowed wheat land, while in 1907 the spring plowed oat land gave 0.6 bushels more than the fall plowed wheat land. The difference between fall and spring plowed oat land in 1907 was 6 bushels, while in 1908 it was 34.1 bushels, fall plowing giving better results in both instances. Spring plowed corn land gave 17.3 bushels less than fall plowed oat land in 1908 while in 1907 the difference was only 1.4 bushels. In 1907 the yield of oats on summer tilled land was 4.9 bushels less than for disked corn land. Neither rye nor peas plowed under for green manure gave as high yields as summer tilled plats in either year.

Soil Treatment.

"The correspondence in the effects obtained from the different crop sequence and times of plowing in the wheat yield of the two years, is much closer than in those of oats. In fact, the only marked difference being that in 1908 fall plowed corn land gave 4.7 bushels more than spring plowed corn land, while in 1907 the spring plowed corn land gave 1.2 bushels more than fall plowed corn land. The yield of wheat, 41.4 bushels, upon the summer tilled plat in 1908 was the best average yield of spring wheat obtained at any station for any year and was markedly superior to that obtained from any of the other plats, although the fall plowed oat land produced a yield of 29.9 bushels the same year.

"I believe that the facts pointed out as shown by these diagrams amply substantiate the statement made in the foregoing discussion con-

DIAGRAM NUMBER FIVE.



The upper half of this diagram shows by curves and figures the average yields in bushels, of Oats raised under different systems of rotation and soil preparation at North Platte, Nebraska, 1907 and 1908; each curve representing the year designated on curve, as follows:

Column No.

1. Yield of Oats on spring plowed land after Wheat.
2. Yield of Oats on fall plowed land after Wheat.

3. Yield of Oats on spring plowed land after Oats.
4. Yield of Oats on fall plowed land after Oats.
5. Yield of Oats on spring plowed land after Corn.
6. Blank, no Oats having been grown on fall plowed Corn ground.
7. Yield of Oats on land disked but not plowed after Corn.
8. Yield of Oats on fallow or summer tilled land.
9. Yield of Oats on land which had Rye plowed under for green manure.
10. Yield of Oats on land which had Peas plowed under for green manure
11. Yield of Oats on land which had Sweet Clover plowed under for green manure.
12. Yield of Oats on fall plowed land after Barley.
13. Yield of Oats on fall plowed land after Flax.

The lower half of this diagram shows the same data for Wheat that the upper half does for Oats.

cerning the danger in figuring conclusions from too limited experience. If one were to consult a single station or a single year almost any kind of a theory could be supported, but when we take into consideration the net results of all the years at the different stations, it will be found that no such hard and fast rule can be established.

"Dr. L. J. Briggs, Physicist of our Bureau, will now present some of the physical and meteorological data which he has obtained in connection with the work which I have just described."

PHYSICAL PROBLEMS IN CONNECTION WITH DRY FARMING.

By L. J. Briggs and J. O. Belz, Physical Laboratory, Bureau of Plant Industry, Department of Agriculture.

"The annual rainfall is frequently the only factor considered in the selection of a dry farm. The object of this paper is to point out certain other factors that often determine the success or failure of dry farming operations.

Precipitation.

"Rainfall records in the Great Plains are now available for a period of thirty-four years. This gives a very satisfactory basis from which to calculate the normal rainfall. The average annual rain for the whole period is about 21 inches. The yearly rainfall for the past thirty-four years for the Great Plains is shown in the accompanying chart (Figure 1). The number of stations on which the records are based is given at the bottom of the diagram. The early records were taken mainly at forts, and are necessarily somewhat incomplete. The highest rainfall during the latter part of this period occurred in 1905, when the average for the whole region was 27 inches. The lowest rainfall occurred in 1893 and 1894, the precipitation for each of these years being less than 16 inches. Another comparatively dry year occurred in 1907 when the average rainfall of the whole area was less than 18 inches. This illustrates the great fluctuations in rainfall to which this whole region is occasionally subject. For any single station the fluctuations are much greater.

Precipitation Not Abnormal.

"A statement has recently appeared in the Chicago papers to the effect that the rainfall of most of the country west of the 99th meridian

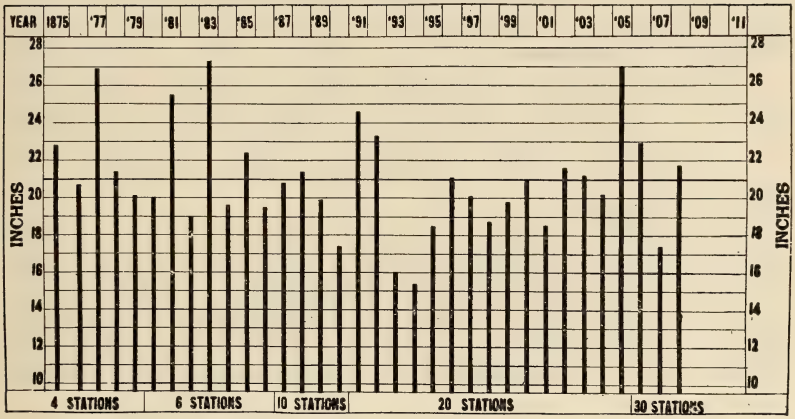

PRECIPITATION GREAT PLAINS AREA

Fig. 1.

has been 50 per cent. above the normal during the past three years. The inaccuracy of this statement, so far as the Great Plains are concerned, is evident from a study of the accompanying chart. The average precipitation for 1906 was 22.9 inches, for 1907, 17.4 inches and for 1908, 21.7 inches. The average for the three years is 20.7 inches which, instead of being 50 per cent. above is almost identical with the normal for a period of thirty-four years. The records, therefore, show that what has been accomplished in the Great Plains as a whole during the past three years, has been done under normal conditions, so far as rainfall is concerned.

Precipitation Not Changing.

"The chart here presented shows that we have no foundation for assuming that any marked change has taken place in the amount of precipitation in the Great Plains. This is well illustrated by the fact just cited that the average precipitation for the past three years is the same as the average for the past thirty-four years. Certain years can be selected having a rainfall well above the normal like 1905. On the other hand, years can be found with a rainfall decidedly below the normal like 1907. During the past ten years, for example, the average rainfall has been only one-tenth of an inch above the normal, based upon observations for thirty-four years.

"While the above averages represent the conditions in the Great Plains as a whole, they do not show the great local variations in the rainfall occurring in this region. Through some strange deviation of the storms from their normal paths, localities in comparatively dry regions are sometimes visited two or more years in succession with bountiful rains. The failure to recognize that such conditions are not normal, and are not what may regularly be expected, has led to much loss and privation in some of these areas. The only safe criterion of the rainfall of a district is the normal based upon observations carried on for at least ten years.

Information for Homeseekers.

"The homeseeker who buys land without a knowledge of the normal rainfall in the immediate district where his prospective farm is located, runs a very great risk. This information can generally be quickly obtained without cost, simply by applying to the weather bureau.

Effect of Precipitation on Yields.

"The monthly distribution of rainfall is often quite as important a factor in the crop production as the total amount of rain. A small annual rainfall properly distributed through the growing season has often produced crops equal to those obtained with a much larger rainfall that was poorly distributed. Again practically the same rainfall distributed through the season in different ways will have a marked effect upon the yield.

Experiment Stations.

"The effect of the distribution of the rainfall is well illustrated in the accompanying precipitation chart for Highmore, South Dakota (Fig. 3). The abundant rainfall during August, 1906, was sufficient to produce a fine crop, the average station yield being over forty-three bushels per acre. In 1907, the corn crop at the same station was very poor, owing to the almost complete absence of rainfall during the month of August. The yield of wheat at the same station during the past three years has been nearly uniform, since no dry weather developed until after the crop was ready for harvest.

RAIN FALL HIGHMORE SOUTH DAK.

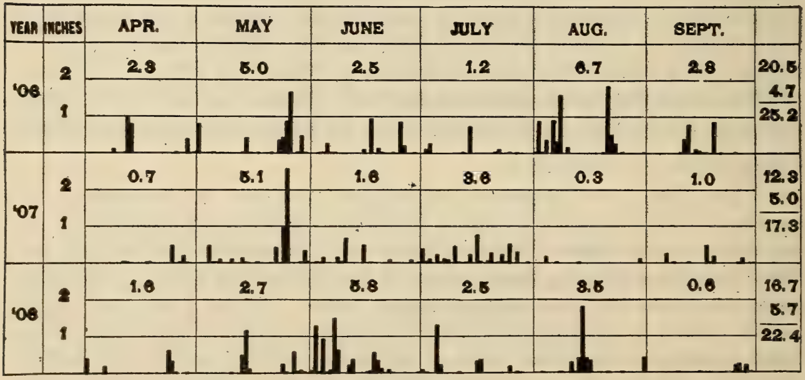


Fig. 3.

Experiment Station.

"The importance of a proper distribution of fall rains where winter grains are grown is shown in the rainfall chart for North Platte,

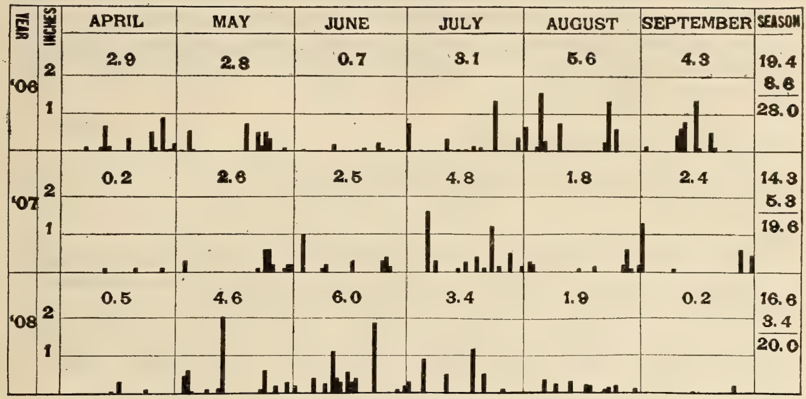

RAIN FALL AT NORTH PLATTE NEB.

Fig. 4.

Nebraska (Fig. 4). The total annual rainfall was practically the same at this station for the years 1907 and 1908, being about 20 inches. In 1907, in spite of a dry August, the heavy rain on the first of September was sufficient to germinate the fall grain. In 1908, no rains occurred after July 21 that were sufficient to wet through the dry surface soil. The 1.9 inches of rain which fell in numerous showers during August was consequently entirely lost before seeding. September was almost completely without rain. As a result, the only fall sown grains that germinated were those sown on summer fallowed land.

Summer Fallow.

"The efficiency of a summer fallow in storing moisture is greatly influenced by the amount of rain falling during the day, and the rapidity with which it comes. Referring again to the North Platte rainfall chart for August, 1908, it will be seen that nine rains occurred during that month, none of which exceeded .4 inches. The total rainfall for the month was 1.9 inches, yet none of the rains were sufficient to wet through the mulch on the summer fallow. It has been the general experience of the men in charge of our dry land stations that rains of less that .3 or .4 of an inch are of no value in storing water in a summer fallow. These light rains serve simply to pack the mulch, and necessitate extra cultivation without increasing the amount of soil moisture.

"The other extreme is met with in the case of torrential rains, where the water falls so rapidly that it has little opportunity to enter the ground, so that a large percentage of it is lost. Even summer fallowed land is not capable of absorbing the rainfall in the case of torrential rains. Observations by Mr. Farrell made last season at the Nephi station in Utah, showed that during a torrential rain of 2.6 inches which fell in about four hours, the summer fallowed plots were able to absorb only an amount of moisture equal to about a quarter of an inch of rainfall. This rain came so rapidly that it seemed to compact and 'sleek' the surface of the summer fallowed land and the rain then ran rapidly off the surface. The stubble plots, on the other hand, which were very dry and showed many surface cracks, took up during this rain an amount of moisture equal to about 1.5 inches of rainfall, approximately 60 per cent. of the total precipitation.

Evaporation an Important Factor

"In considering the problems of dry farming, it must be remembered that the amount of water required to produce a crop is dependent primarily upon the amount of evaporation. Evaporation is in turn dependent upon a number of factors, the principal ones being the temperature and moisture content of the air and the wind velocity. The evaporation increases as the temperature of the air or the velocity of the wind increases. The evaporation decreases as the amount of moisture in the air increases. High temperature, high wind, and dry air together result in the loss of a large amount of water from the crop and the soil.

Soil Treatment.

"The loss from the soil can be controlled to some extent by surface cultivation. The loss from the leaves of the crop is not under our control. The more severe the conditions which determine the evaporation, the greater is the amount of moisture lost through the leaves of the plant. A knowledge of the amount of evaporation in different dry farming sections thus becomes of fundamental importance in selecting a dry farm.

Evaporation.

"The evaporation at the government experimental stations is determined by measuring the loss of water from a tank eight feet in diameter and two feet deep buried in the soil with its top four inches above the surface, and kept filled with water to approximately four inches from the top of the tank. Such measurements do not, of course, represent the evaporation from the soil, but they serve to give us a valuable comparative measure of the evaporation in different parts of the country. The accompanying evaporation chart (Fig. 2), shows the evaporation during the summer months for the year 1908 at Edgeley, North Dakota; North Platte, Nebraska, and Amarillo, Texas.

"The amount of evaporation for ten day periods during each month is represented by the height of the vertical lines (Fig. 2). The amount of evaporation in inches can be found by comparing the lengths of the lines with the scale at the left of the diagram. It will be noted that there is a marked variation in the evaporation for different ten-day periods throughout the season. The maximum of evaporation in Texas occurred in June, in North Dakota the last part of July, while at North Platte, Nebraska, the highest evaporation occurred in September which was an extremely dry hot month. It is of special interest to note the manner in which the evaporation increases as one proceeds south through the Great

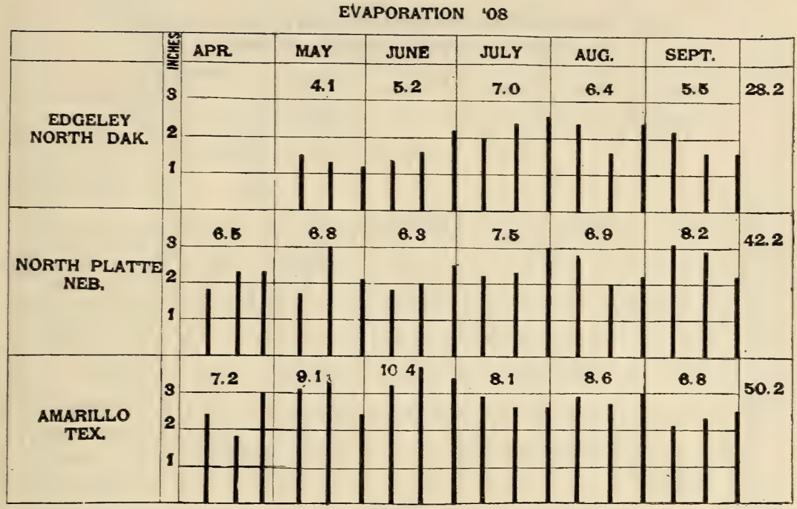


Fig. 2.

Plains. The evaporation for the six summer months at Edgeley was about 30 inches, at North Platte about 42 inches, and at Amarillo about 50 inches. For the same rainfall, then, the conditions at the southern stations would be much more severe than at the northern stations, owing to the increased rate of evaporation.

Soil Moisture Determinations.

"The real criterion of the resultant of the rainfall and the various factors which tend to dissipate it, is found in the moisture content of the soil. The accompanying charts (Figs. 5-6) show the results of a series of soil moisture determinations for the years 1907 and 1908, made at the co-operative stations in the Great Plains. The determinations at Edgeley, North Dakota, were made by Mr. E. C. Chilcott, and at North Platte, Nebraska, by Mr. W. W. Burr.

"These charts show the changes taking place in the soil moisture during the growth of the crops on the co-operative experimental plots of the Office of Dry Land Agriculture of the Department. The lines on the chart show the changes in the moisture content during the growing season for four plots treated in different ways. The yields given for the different plots were furnished by the Office of Dry Land Agriculture.

"In each case 'A' was spring plowed, 'B' was fall plowed, 'C' was fallow in 1907, and 'D' was fallow in 1906 and 1908.

Moisture Determinations in Wheat.

"Referring first to the diagram No. 5, from Edgeley, North Dakota, showing the soil moisture determinations made in connection with wheat, it will be noted that the 'D' plot, which was fallowed on the previous year, starts off with a larger amount of moisture than either the

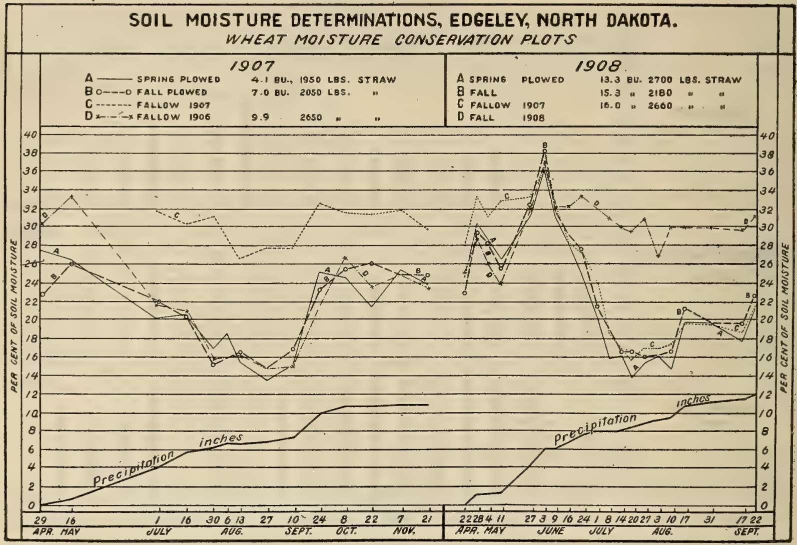


Fig. 5.

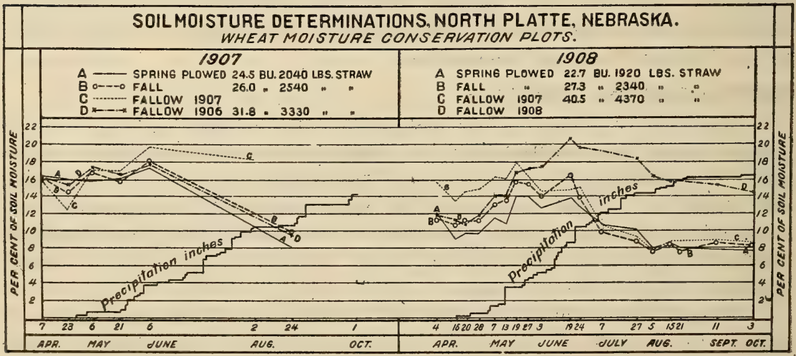


Fig. 6.

spring or fall plowed plots. On the first of July, however, all of these plots had reached practically the same moisture content, and this was maintained for the rest of the season. The months of July and August were very dry.

Summer Fallow.

"All of the yields were low, but the beneficial effect of the fallow is seen in the greater yield of that plot. The difference in yield is, however, sufficient to justify fallowing in preference to fall plowing. The line marked 'C' shows the moisture content of the summer fallowed plot during the season, which remains uniformly higher than the plots on which the crops were grown, but which falls off considerably during the drouth in August. After the wheat was cut, the rain in September materially increased the moisture content of the cropped plots, which, late in the season contained about 24 per cent. of moisture as compared with 30 per cent. in the summer fallowed plot.

Precipitation.

"Referring now to the determinations in the spring of 1908, it will be noted that the fallowed plot lost some moisture during the winter and spring, while the cultivated plots remain practically the same. Heavy precipitation during the spring of 1908 brought the moisture content of all the plots up to 37 per cent, which is seen to be considerably above that which the summer fallow is capable of maintaining during the season, which is in this particular case about 30 per cent. At the end of the season of 1908, the summer fallowed plot is seen to contain about 10 per cent more water than the cropped plots. Owing to the increased precipitation of 1908, the effect of the summer fallow upon the yield is not marked.

Experiment Station.

"Corresponding moisture determinations under wheat upon the different tillage plots at the North Platte station are given in chart No.. 6. The soil at North Platte is of a much more open texture and much deeper than the soil at Edgeley. Owing to the wet fall of 1906 all of the plots started out with practically the same moisture content at the beginning of the season of 1907.

Summer Fallow.

"The effect of the summer fallow, however, is seen in the increased yield, which in this case is probably due in part to the increased amount of plant food made available through summer tillage. In the fall of 1907, North Platte was rather dry, so that the effect of the moisture stored up in the summer fallow plots is readily seen in the chart of 1908. The combined effect of increased moisture and plant food in the summer fallowed plot resulted in 1908 in a marked increased yield, although the moisture content at the end of the season was practically the same on all of the plots. The fall of 1908 was very dry as will be seen by reference to the precipitation charts of North Platte, and the amount of moisture stored up in the summer fallow, plot 'D,' as the result of this treatment is very evident from the diagram.

Moisture Determinations in Corn.

"Referring now to the moisture determinations in the corn plots, it will be noted that there is no striking difference in the moisture content in any of the tillage plots at the beginning of the season of 1907 (Figs. 7 and 8). This is due to the large amount of rain occurring in the fall of 1906 at practically all of the stations, as will be seen by reference to

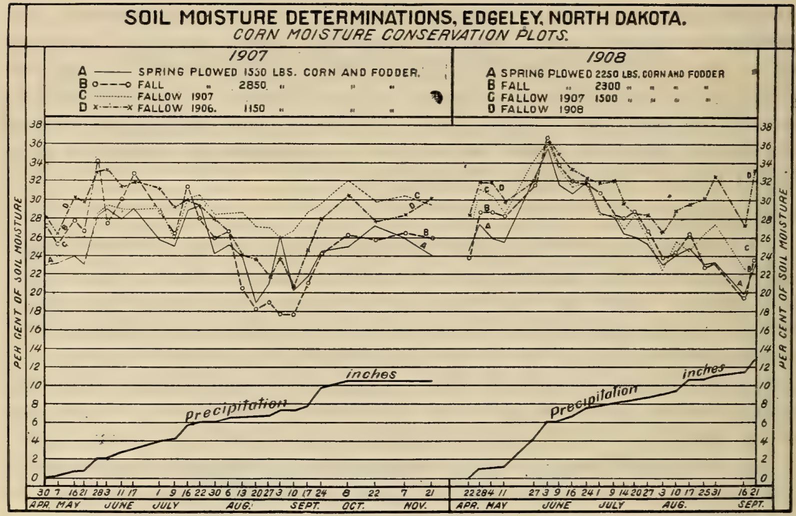


Fig. 7.

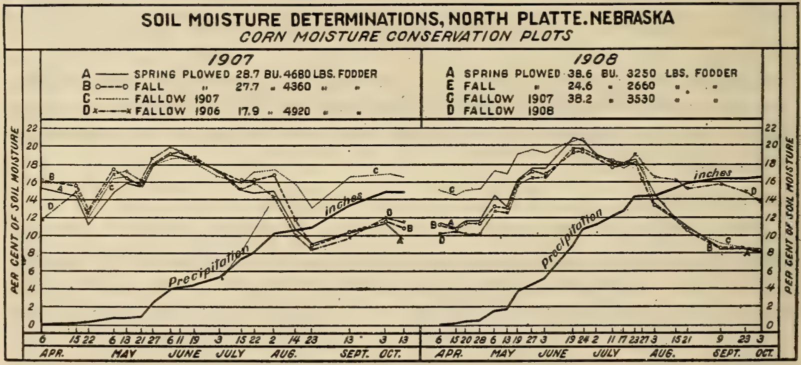


Fig. 8.

the rainfall diagrams. Since, in the case of corn all of the plots were cultivated, the moisture content of the different plots does not differ materially until the season is well advanced. These differences are not in any case nearly so marked as in the grain crops, owing to the moisture which is conserved as a result of cultivation in the corn. Prof. Chilcott's investigations have shown that corn after summer fallow at many of the stations in the Great Plains gives yields no better or even inferior to those on spring or fall plowed land. Corn requires a warm soil in order to make a good growth in the spring, and the increased moisture in the fallowed plots would tend to make these plots colder than spring or fall plowed land. This may serve to explain in part the lower yields obtained with corn on summer fallow.

"At the end of the season of 1908, the moisture conservation plots in the corn series showed at all of the stations excepts Hays a marked increase in moisture as compared with the cropped plots.

"The results for the season of 1909 on the corn series will be of special interest, particularly if we have a dry spring, in view of the marked difference in the moisture content in the summer fallow and cropped plots at the present time.

Committee Change.

SECRETARY BURNS: "I wish to announce that C. W. Richards, of Utah, has been substituted for Dr. John A. Widtsoe on the Resolution Committee."

Norris Accepts.

The Secretary then read the following telegram, which evoked prompt applause:

Helena, Montana, February 24, 1909.

"J. A. McKinley, Care of Dry Farming Congress, Cheyenne.

"Express to Congress my hearty appreciation of distinguished honor conferred. My best efforts will be given to discharge of duty.

"EDWIN L. NORRIS."

ADOPTION OF DRY LAND GRAIN TO LOCAL CONDITIONS

Professor W. M. Jardine, in charge of Dry Land Grains, Department of Agriculture, Washington, D. C., addressed the Congress as follows:

"I am sure we are all fortunate during these sessions in having the privilege of listening to so many able discussions touching upon the various phases of dry land agriculture. Most of the papers, however, presented thus far, have treated almost entirely of crop rotation, conserving of moisture, the relation of live-stock to dry farming and various other practices that undoubtedly must be considered, if we are to have a permanent agriculture in the dry lands. There are other phases, however, of dry land agriculture that need our consideration. The crop, for instance, is the thing in which we are all vitally concerned. There is a large variety of crops that will likely succeed fairly well on the dry land, but we are confronted with a problem at present, and that is the continuatious croppings to wheat, or I mean the system of wheat growing, either continuously, or in the summer fallow method.

"Dry land agriculture is at present in what might be termed a transitional stage. It is rapidly emerging from the pioneer stage, where the main object was to supply an immediate need in local consumption and at the same time secure a permanent foothold upon the land. It is arriving at a point where the amount of produce exceeds local consumption and must find a market in competition with the products of older agricultural regions.

"The pioneer in any branch of agriculture is shut out from the modern conveniences of older sections, and is confronted with conditions unfamiliar to him. His attention is given almost entirely to the subjection of his land and familiarizing himself with his new environment. As long as his time, his thought and his energy are thus directed, it is quite natural that but little attention is given to the development of crops of superior quality; but when the question of local consumption is settled and the farmer seeks a ready-money market for his products, conditions change. It is no longer merely a question of quantity, but quality and quantity. He must meet the demands of competition by supplying a product that the market is calling for.

Crop Quality.

"The wheat market of the world today demands quality as well as quantity; and because of this fact, we now witness a variation in prices between different grades of from one to twenty cents per bushel. Twenty cents a bushel is not an alluring advantage in favor of the high quality, and wheat growers today see plainly the desirability of producing a variety of superior quality as well as high yielding power. This question of quality along in wheat production, therefore, presents a problem worthy of careful study. It is a question to which the best wheat producer of the arid region should begin to give serious consideration.

Seed Breeding.

"In my paper on 'Dry Land Cereals' before this Congress in 1908, I attempted to show the necessity of selecting and developing a few types of grain that would give a good yield of a high quality. I pointed out the fact that the varieties we are growing at present are very badly mixed and that of these varieties there could be only one best variety for a given locality, and therefore our first step in increasing the yield and improving the quality of our wheats should be directed towards the elimination of all except the best variety for each particular secion. This accomplished, we would then have our grain at least placed upon a basis where we could begin actual improvement work. Having decided upon our types, we could then turn to the development of superior strains.

Seed Breeding.

"At first sight the improvement of our varieties appears to be rather simple, but when we examine into the facts already known relative to wheat improvement, we discover numerous complexities. One of the most striking and important factors that demand consideration is environment. It is the relation of invironment to wheat production that we shall deal with here, by a comparative study of the results obtained in different localities, the methods of production and the variety of wheat being the same in each case.

Government Co-Operation.

"In 1905 the Office of Grain Investigations of the Bureau of Plant Industry, U. S. Department of Agriculture, started a series of experiments with the collaboration of the Bureau of Chemistry of the Department, and in co-operation with State Experiment Stations, for the purpose of obtaining information on this subject.

Seed Breeding.

"The experiments consist in growing winter wheat (from the same original seed) in each of three typical and dissimilar localities, Kansas, Texas and California; and also spring wheat in South Dakota, Kansas and California. Seed of the crop from each locality are sent to the other two and there grown along side of the continuously-grown seed. We thus have three plots at each station, all from the same original seed; one plot grown continuously at that point, and the other two plots coming from the other points of the triangle. We have styled them, therefore, 'triangular' experiments. By this method of interchanging seed we are enabled to determine the influence of environment and of the seed on the crop.

Wheat Development.

"Two varieties of wheat were used in our experiments: (a) Kubanka, a durum wheat and a spring variety, grown in South Dakota, Kansas and California; (b) Crimean, a common wheat and a winter variety, grown in Texas, Kansas and California.

The chemical work in these experiments was done by LeClerc and Leavitt of the Bureau of Chemistry. The analytical data in this paper are taken from their report to the office of Grain Investigations.

Kubanka Durum.

"The original Kubanka seed used for the South Dakota, Kansas and California triangle was grown in South Dakota in 1905, and sent to Kansas and California for the 1906 seeding, a sample likewise being grown in South Dakota in 1906. The crop thus obtained at each station formed the real starting point of the triangular experiment. The South Dakota seed of 1906 was then sown in South Dakota in the spring of 1907 and further, a sample was sent to Kansas and one to California for the 1907 seeding. Likewise, the 1906 Kansas crop was sent to South Dakota and to California for 1907 seeding, and seed was also sown in Kansas in 1907 The same was true in California.

Crimean Wheat.

"In exactly the same way a sample of Crimean was grown in Texas, Kansas and California, the original seed being grown in Kansas in 1905. Samples of each crop were collected and analyzed, the weight per bushel, the character and flinty or starchy condition of the grain and the protein content being determined. It will not be necessary to dwell on many of these results, the greatest variations are the per cent of protein, weight per bushel, and the per cent of starchy grains. The other constituents varied appreciably, to be sure, but they will not be especially noted. The most important constituent of wheat being protein, the variation of that constituent will be discussed first.

Protein Experiments.

"Beginning with the Crimean wheat, we notice that the per cent of protein in the original Kansas seed, grown in 1905, was 14.53 ;in 1906, the following is the composition: Kansas, 17.27; California, 9.8, and Texas, 10.88; a difference of over 8 per cent, due entirely to a change of environment. In 1907 all three plots of wheat grown in Kansas from Kansas '06 seed, California '06 seed and Texas '06 seed, gave the following: 20.23 per cent, 20.73 per cent and 20.45 per cent respectively Those grown in Texas in 1907 from Texas '06 seed, Kansas '06 seed and California '06 seed, gave 16.45 per cent , 15.33 per cent and 16.47 per cent, respectively And those grown in California in 1907 from California '06 seed, gave 10.26 per cent, 10.26 per cent and 9.91 per cent, respectively.

Kansas Results.

"It will thus be seen that apparently the crop is not at all influenced by the composition of the seed nor by the source of the same. For example, California seed of 1906 with 9.8 per cent protein, increased to 20.74 per cent in Kansas in 1907, or 120 per cent, whereas Texas seed of 10.88 per cent protein gave 20.46 per cent in Kansas, and Kansas seed with 17.27 per cent protein gave 20.23 per cent when again grown in Kansas. In other words, all the grain grown in these three plots in Kansas, viz., from California seed, from Texas seed, and from Kansas seed, all three differing in protein content from 9.8 per cent to 17.27 per cent respectively, produced a crop of identical protein content, and of practically the same composition generally, the weight per 1000 kernels, the weight per bushel, and character of the grain being same.

California Results.

"In the same way, when the Kansas seed with 17.27 per cent. protein, the Texas seed with 10.88 per cent. protein, and the California seed with 9.8 per cent. protein, were all grown in California, the composition of the resulting grain from the three plots was almost identical, viz.: 9.91 per cent., 10.26 per cent. and 10.26 per cent. protein. The per cent. of the other constituents was likewise the same in all three samples, as were also the physical characteristics.

Texas Results.

"The three samples grown in Texas from Kansas seed, California seed, and from Texas seed, likewise were identical in composition and in physical appearance, although the seed producing them varied widely, as we have just seen, both physically and chemically. The same kind of results were obtained with Kubanka wheat grown in South Dakota, Kansas, and California.

Dry Land Gave Higher Percentage.

"The figures just quoted give the protein contents calculated on a wet basis, the samples containing about 10 per cent. of water. Calculated on a dry basis, the protein content is about 2 per cent. higher in each case.

"Before taking up the question of yield, it may be well to offer an explanation as to the reason of this remarkable variation in protein content. There is considerable difference in the length of the ripening period in the localities where the tests were made, and this one element of environment undoubtedly brought about the variation in protein content.

Effect of Climate.

"It is pretty well understood that the shorter the ripening period is, the higher the protein content will be. The protein material of the wheat berry is elaborated first, and during the remainder of the period, starch is accumulated. Hence we have a large percentage of starch in wheat produced where the ripening period is long and cool, and a low starch and high protein content in wheat produced in a short ripening period. It is a well known fact that when we prolong the period of ripening by applying irrigation water, we obtain a berry of low protein and high starch content.

"Our climate data show that the ripening period in California is both longer and cooler than it is in Kansas. In South Dakota the ripening period is shorter than that of California and Texas, and longer than that of Kansas. The Texas ripening period is shorter than that of California but longer than that of either of the other two stations. Kansas has the shortest ripening period and produces the highest protein content in wheat. South Dakota, Texas and California, in the other named, have the next shortest ripening periods, and produce wheat with protein contents varying uniformly, the shorter periods always producing the highest protein content. The reports of the weather bureau show occasional slight variations from the above enumerated features of the ripening periods; but the general average is as stated.

Acclimated Seeds.

"In all cases where the yield is recorded, the continuously-grown seed produced from 1.5 to 5 bushels per acre more than the seed brought from a distance. For example, in Texas in 1907, the Texas seed yielded 12 bushels, the Kansas seed, 10.68 bushels, and the seed from California produced only 8.32 bushels per acre. These are yields of the winter wheat (Crimean). In the same year, the Kubanka spring wheat grown at South Dakota produced the following yields; continuously grown seed, 20.6; Kansas seed, 15.16; California seed, 18.83 bushels per acre. In 1908, the results were practically the same, the yield of the continuously grown seed exceeding that of the seed brought from a distance. In other words, our results show that there is no advantage, even in the yield, in bringing seed of a given variety from a distance to replace home-grown seed of the same variety. In fact, there is usually a loss in yield, and no gain in quality.

Keeping Pure Seed.

"The points which I have attempted to bring out in this paper refer only to the interchange or introduction of seed of the same variety and not to any discussion of the relative merits of different varieties for different localities. I do not wish to be understood, either, as stating that any definite stereotyped rule can be laid down in regard to the interchange or introduction of seed wheat between different localities, for there will always be instances where it will be desirable to bring seed from outside districts to replace home-grown seed of the same variety that has become foul with weeds and mixed with other varieties through careless methods of farming. Such instances, however, should be the exception.

Seed Importation.

"There are many agricultural districts where varieties inferior, both in yield and quality, are now being grown. In such instances it would most certainly be profitable to introduce seed of a more desirable type; but this once done, seed for future crops should be taken from the home-grown product. In other words, in order to permanently improve the quality of wheat it will be necessary to carry on the improvement work within the locality where it is expected that the improved strain is to be grown. It would be impossible to breed up a variety of Turkey wheat, for instance, in Kansas that would be best suited for growing in California. It would be much better, and in fact necessary, if the quality be improved, to first take the variety, Turkey wheat, to California, if not already grown there, and carry on the improvement work in California.

Improving Seed.

"I would advise those farmers who expect to improve their varieties of wheat, first, to secure the best possible variety for their respective localities, both as to yield and quality; and second, to maintain the high standard of the chosen variety by carrying on the necessary improvement work upon their own farms. If these two rules are observed, there will be little doubt that the quality of our grains will be much improved and that more of our farmers will be securing the top market prices for their wheat in place of second grade prices as is too frequently the case today."

EFFECT OF CLIMATE ON CROPS.

Address by W. S. Palmer, Section Director, U. S. Weather Bureau, at Cheyenne:

"Mr. Chairman and Members of The Dry Farming Congress. I don't need to say to the visitors to the city in speaking of the climate of Wyoming that we sometimes have a little snow at Cheyenne.

Dry Farming Area.

"That portion of our country which is commonly spoken of as the semi-arid region, and where so-called dry farming is practiced, embraces a large territory which is included between the 95th and the 125th degrees of longitude west of Greenwich. Within that belt of 30 degrees of longitude can be found a vast variety of climates ;its topography is such that along its northern border winter temperatures of from 50 to 60 degrees below zero may be experienced at times, while during the summer, temperatures as high as 120 degrees above zero may be recorded in the deserts of Arizona and southern California.

Precipitation.

"There is, also, a great variation in the annual precipitation of the various sections of this region, for in some of the mountain districts or along the Pacific coast the annual amounts may exceed 50.00 inches, while some of the desert regions have annual averages of less than 5.00 inches. On account of the broad area embraced within this region and the various climates that may be found therein, I do not wish to discuss in detail the climate of but a small portion of the semi-arid region, so I shall confine my address to a discussion of some of the climatic features of Wyoming, a subject which has received my special study during the last ten years or more. While my remarks will be confined mostly to a discussion of the climate of Wyoming, they will, in general, apply to a large portion of the country which is now being cultivated by the so-called dry farming method, Wyoming being located near the center of the dry farming belt of the West.

Wyoming Climate.

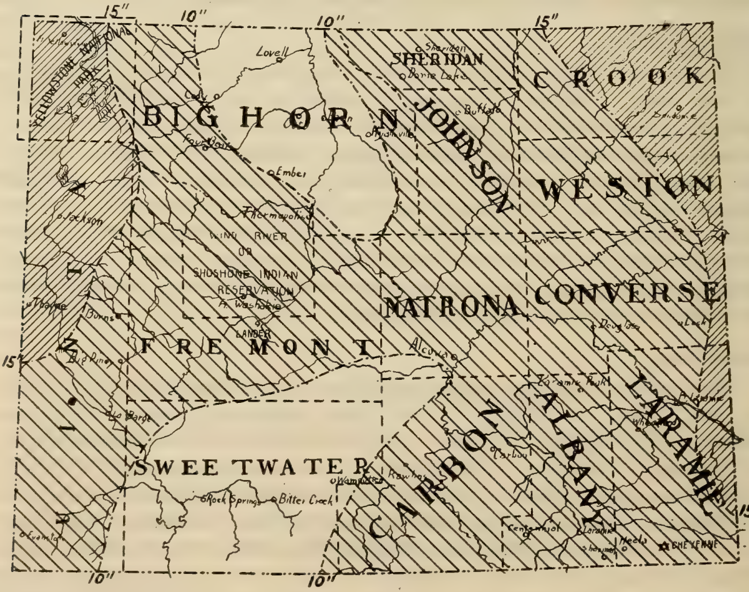
"During the last seventeen years a systematic collection of weather data has been made in Wyoming. In addition to the weather records which have been kept at the regular weather bureau stations where commissioned men are stationed, a large number of valuable records have been kept by persons who have been supplied with standard instruments by the government and who have co-operated with the weather bureau in this work. The value of these records which have been voluntarily kept by the co-operative observers cannot be overestimated, as they furnish data from the sections of the state where there are no regular weather bureau stations.

Precipitation

"The most essential element in the success of dry farming is moisture, and I wish to present to you some Wyoming records regarding precipitation. From the monthly reports which have been compiled in the Cheyenne office from records kept at stations distributed over nearly all sections of the state, it has been determined that the average precipitation for the state as a whole during the last seventeen years has been 13.68 inches, or a trifle more than thirteen and one-half inches. This average does not take into consideration the heavy precipitation which may fall in the high mountain districts where very few reliable records have ever been kept, but it is a fair average for that portion of the state below 8,000 feet, or for all of those districts where cultivaion is possible. The precipitation herein spoken of includes rainfall and snowfall, the later being reduced to its water equivalent.

Precipitation.

"While the average amount for the state is 13.68 inches, there is a wide variation in the normal amounts received over the various sections of the state. There are portions of Big Horn and Sweetwater counties where the average annual precipitation is probably less than 5.00 inches, while over the extreme northeastern and extreme northwestern portions of the state there may be a few sections where the annual average is nearly 20.00 inches. On a map which I have prepared to accompany this paper, I have endeavored to show the geographical distribution of the rainfall throughout Wyoming; the peculiar and complicated topography of the state causing a wide variation in the annual precipitation over the various sections. The unshaded portions of the map show areas of the state where the average annual precipitation is less than 10.00 inches, and you will notice that those areas embrace only portions of Big Horn county and the red desert region, the aggregate of which is only a small percentage of the total area of the state. I believe that most of the dry farming experts of today do not advise that dry farming be attempted in regions where the annual precipitation is less than 10.00 inches, so the unshaded portions of the map show regions where dry farming attempts should not be made at the present day. The darkest shadings represent areas where the average annual precipitation is in excess of 15.00 inches, and here again you will notice that those areas represent only a small percentage of the total area of the state. It is probable that about 75 per cent. of the total area of the state is embraced within

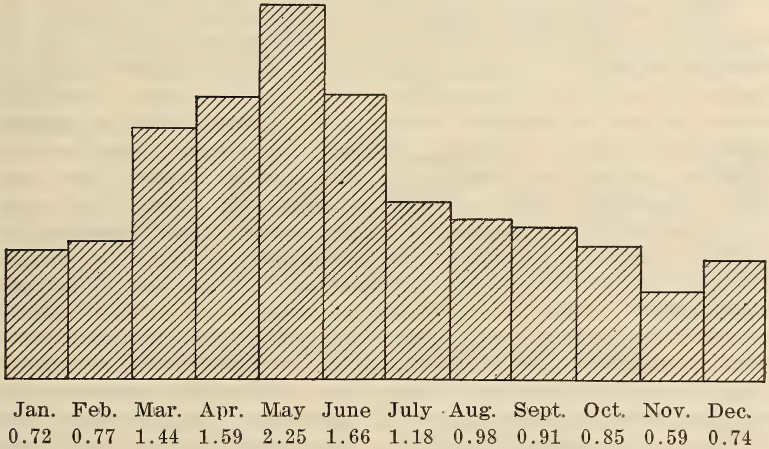


the region which received from 10.00 to 15.00 inches annually, such area being represented on the map by the light shading. Thus you can see that a large portion of this state receives an average annual rainfall sufficient, so we are told by the dry farming experts, for the successful growth of certain crops where proper methods of cultivation are followed.

Precipitation Distribution.

"From the large number of monthly records which have been compiled at the Cheyenne office, covering a period of seventeen years, I have computed the average monthly precipitation for each month of the year, and have shown the amounts graphically on the accompanying chart (Page 171). From it, you will notice that the monthly amounts of precipitation increase from January to May, which has the highest average of any month of the year; a gradual decrease in the monthly amounts is noted from May to November which shows the lowest average for the year. From the chart, you can readily see that in this section of the semi-arid region the rain falls during that time of the year when it is most needed for the crops, that is, about 70 per cent. of the total annual amount falls during the six months, March to August, inclusive. There is some variation in the average amounts for the different seasons for the different sections of the state. I give below the percentage of the total annual averages which falls during the six months period, March to August, inclusive, for a number of selected stations:

MONTHLY PRECIPITATION FOR WYOMING.



"Cheyenne, percentage, 75; Buffalo, 75; Ft. Laramie, 73; Laramie, 72; Sheridan, 68; Lander, 66; Bedford, 55; Evanston, 54; Yellowstone National Park, 50.

"From this, it can be seen that a much greater portion of the average annual precipitation falls during the six months period, March to August, over the eastern portion of the state, than over the western counties. In Utah, less than 40 per cent of the average annual precipitation falls during that period, March to August, inclusive.

Precipitation Reliable.

"The April-May precipitation for the state is a very reliable factor. During the last 28 years, there has been but one year during which the precipitation at Cheyenne has not been in excess of 2.50 inches, for the two months, April and May, and that was in 1886 when it amounted to only 1.44 inches.

Topographical Effect.

"The varied topography of the state gives a wide variation in the temperature conditions of the various sections of the state. In some sections, the growing season is from four to five months in duration, and summer temperature rises to 95 or 100 degrees or even higher; over some of the higher agricultural districts, the growing season is short, summer temperatures never rise above 95 degrees, frosts may be experienced any month, and only the hardier grains and vegetables can be successfully grown.

Sunshine Effect.

"The percentage of sunshine in Wyoming is much in excess of the percentage which is received throughout the Mississippi valley and this excess of sunshine is a very important factor to be considered when discussing the agricultural possibilities of the semi-arid region. The actual number of hours of sunshine which a plant receives during its growing period has never, I believe, received its proper share of consideration when the length of the growing season has been under discussion; other conditions being the same, that plant will make the best progress and development which receives the greatest amount of sunshine. The percentage of sunshine received throughout the central and upper Mississippi valley is about 45 per cent of the possible amount; in Wyoming, and most of the semi-arid region, the percentage is 60 or above. That is, for every three hours of sunshine which is received in the Mississippi valley, we receive four or more in this section of the country. Thus, if we consider the progress which should be made by growing crops by considering only the one element of climate, the sunshine, the crops in the semi-arid region should make as much progress in three months as the same crops would make in four months in the Mississippi valley.

"I believe that the high percentage of sugar in the beets which are raised in this western country is due to the high percentage of sunshine which they receive during their period of growth. I do not wish to carry the discussion of this subject further, but I wish to say again that I believe that this subject has not received the consideration that it should.

Seed Breeding.

"The seed men of the northern districts of this country have always contended, and with good reason, that northern grown seeds are the best; to this the seed men of the western districts should add that the higher the elevation at which seeds are grown, other conditions being identical, the better will be the seeds. The dry farmer can, with equally as good reason, contend that the seeds which are produced with the minimum amount of moisture for their successful production are superior to the seeds which have been grown where an excess of moisture has been used. That section of the country which combines the three conditions, namely, northern latitude, a moderate elevation above the sea level, and a rainfall not in excess of the actual needs of the plant growth, should prove to be a place where the very highest class of seeds can be produced.

"The farming belt of this country was a few years ago brought to to the eastern edge of the semi-arid region, and within the last few years it has been rapidly covering, by irrigation and so-called dry farming methods, large areas in what was once known as the Great American Desert. Crops are being successfully and profitably produced in regions where a few years ago it was considered that the precipitation was not sufficient to raise crops. This has not been due to a change in the climate of any part of our country, because the life of man is too short to see any changes in the climate of any section; the weather of the successive years may, and does, vary somewhat, but our climatic conditions persist.

Conservation of Moisture.

"Men have been learing how to conserve the moisture which falls, and to adapt the proper crops to the conditions of a limited rainfall. These are two lines of study which must be carried along till all of the available lands of our country, even in regions of a rainfall of less than 10.00 inches, can be successfully used for the production of some kind of a crop."

SELECTING THE CONVENTION CITY.

CHAIRMAN BOWMAN OF EXECUTIVE COMMITTEE: "Gentlemen: The Executive Committee will meet at nine o'clock tomorrow morning in room 8, Annex building, to receive applications for the place of meeting of the next Congress. At eleven o'clock tomorrow it will be a special order of business to decide where to hold the next Congress. This evening there will be a great many Cheyenne people here to hear the concert. The lower floor will be reserved for delegates and their ladies until eight o'clock and then it will be thrown open to the public. Prior to eight o'clock the galleries will be reserved for the citizens of Cheyenne."

GOVERNMENT EXPERIMENTS OF WYOMING.

Mr. O. W. Bryant, Irrigation Manager of the U. S. Reclamation Stations at Cheyenne and New Castle, made the following statement of unpublished data:

"In certain districts of the semi-arid portion of the United States, so-called dry land farming has been notably successful during the past few years. This has probably been due to the introduction of new drouth resistant plants, scientific tillage of the soil, and rainfall above the normal.

Durum Wheat.

"Of the drouth resistant plants probably Durum wheat has been most successful and has made the greatest showing in the shortest length of time. This wheat was introduced by the United States Department of Agriculture from the plains of Russia and Africa in 1899 to 1902. It withstands the dry weather exceptionably well and has found a suitable home west of the 99th meridian. In 1906, twenty million bushels of Durum wheat were exported to Europe, while in 1907 the total yield of the United States was forty-five million bushels. This was practically all grown in the dry farmed belt and covered about three million acres of land.

Conservation of Moisture.

"All advocates of dry land farming will advise conservation of moisture in the soil. This is no doubt the most important factor entering into scientific dry land farming. Some teachers show us one way to prepare the soil for the retention of moisture while others discuss methods slightly different, but they all come to the same conclusion, viz.: that a blanket of fine soil mulch must cover the ground to prevent excessive evaporation.

Soil Treatment.

"The truth of the efficiency of this soil mulch is nicely shown in Bulletin 177, by Dr. Fortier of the Office of Experiment Stations, United States Department of Agriculture. In one experiment water was applied to a depth of 3-14 inches to several tanks of earth and varying dry soil mulches were placed over the wet earth. The tanks were then allowed to stand fourteen days. At the end of this time the soil with no mulch lost .72 of an inch; that with a four inch mulch lost .21 of an inch; that with an eight inch mulch, .10 inch; and that with a ten inch mulch lost but .03 inch.

Evaporation

"In another experiment where the soil was cultivated six inches deep after a regular irrigation, 50 per cent. less moisture was lost than where the soil was not cultivated at all. These experiments were carried on for several years and the results show conclusively that a soil mulch is a potent factor in the material success of dry land farming as an enterprise.

Precipitation.

"By taking Miles City, Montana; Cheyenne, Wyoming; North Platte, Nebraska; Dodge City, Kansas; and Amarillo, Texas, as representative points in the semi-arid belt, we find, by consulting the weather bureau records, that during the past five years the total rainfall has been from six inches to two feet above the normal in the dry farmed district. At Cheyenne, during the growing season of 1908, i. e., the months of May, June, July and August, we had a greater amount of rainfall than during the same months for the last 38 years. This must be taken into account when considering the results of our efforts on the Cheyenne farm this past season. At our second farm near Newcastle, Wyoming, the rainfall was abundant during the entire season, except at the period of the filling of the grain.

Experiment Stations.

"Having studied the conditions under which many homesteads on our semi-arid plains were at one time abandoned, and realizing that this enterprise was again assuming broad dimensions, this office saw fit, about three years ago, to establish three stations in Wyoming and Colorado, where small areas would be irrigated and a few crops and trees grown, should the season at any time prove too dry for the growth of the general farm crops. In order to show the value of a little water in connection with dry farming, out of necessity, we established extensive farms at Cheyenne, and Newcastle, Wyoming, and at Eads, Colorado. Here we are attempting, on quite a large scale, dry farming experiments according to the latest advanced scientific methods.

Cheyenne Results.

"In the summer of 1905 we located ourselves one and a half miles east of Cheyenne upon a virgin prairie where the sod was turned and the ground prepared for planting the following season. The elevation is about 6,000 feet. The location was not chosen altogether for its soil value and there are other districts where we would probably find more fertile land, but, if we are successful upon this soil, there should be no cause for failure upon a better soil if the proper methods were employed. The only seed planted in 1905 was a little Silver King wheat and fall rye.

Average Yields.

"They both suffered from severe winds and the rye produced only about 16½ bushels per acre while the wheat yielded 20 bushels per acre. During 1905 we had 22.68 inches rainfall and in 1906, 17.65 inches. This excessive precipitation proved a great benefit to the spring planted crops. Durum wheat yielded as high as 25 bushels per acre, while spring rye produced 20¾ bushels per acre; field peas gave us 16 bushels per acre and potatoes 90 bushels. The potato crop was universally poor this year and when thses results are compared with those of the greater part of the potato growing district they are found to be very favorable. A hail storm passed over the farm just after some of the grain had been cut.

This, of course, thrashed out some of the berries, reducing the yield materially.

Summer Fallow.

"In the fall of 1906 we planted more grain on summer fallowed ground, but the dry, cold winter was a little too severe for it and the results were not very satisfactory. The rainfall during this year was below the normal and the grains felt it keenly.

Potatoes.

"The potatoes, however, on the summer fallowed ground which was continuously cultivated produced a very good crop, yielding 91 bushels per acre, notwithstanding their tops being at one time laid flat by hail. Potatoes seem to be one of the most remunerative crops for this country, and it might be interesting to note here that we have never discovered a potato bug nor a flea beetle upon our vines.

Sugar Beets.

"Dry farmed sugar beets on continuously cropped land produced a little over seven tons per acre.

Precipitation.

"The rainfall during 1907 and the early part of 1908 was very scant indeed, and fall planted crops suffered accordingly, being winter killed to a great extent. Those grains planted in the spring also suffered the lack of moisture and it was not until the beginning of the late spring rains that the plants began to show any encouraging growth at all, remaining brown and yellow up to this time. After they were growing nicely two rather severe hail storms did considerable damage and the plants never fully recovered.

Average Yields—Summer Fallow.

"The potatoes were planted after the rains began and consequently had plenty of moisture, but they too were damaged by hail. The yields in 1908 were as follows: On summer fallowed land, potatoes, 109 bushels per acre; barley, 22 bushels per acre, weighing 62 pounds per bushel; and peas, 7 bushels per acre. The hail thrashed out about one-half of the peas and the potatoes were so badly beaten by it that a great many of them did not mature. We had prospects of raising 140 bushels per acre before the hail storm passed over the farm.

Potatoes.

"On continuously cropped land we produced 93 bushels of potatoes per acre, 12½ bushels of beardless barley per acre, and ten tons of sugar beats per acre. The beets contained about 17 per cent. sugar but were rather low in purity.

Sugar Beets.

The dry farmed beets did not yield as well as the irrigated beets but were superior in sugar content and purity. Brome and slender wheat grasses did very well, but alfalfa was not so encouraging.

Newcastle Results.

"The department's farm in northeastern Wyoming is located about five miles north and west of Newcastle, in Weston county. The soil is a very heavy loam, and while probably not the best soil in the community, it is fairly representative. A small creek passes along one side of the farm which flows until the first of August. When the Department of Agriculture took possession of this land it was entirely covered with sage brush and cacti, and consequently was in its natural state. Part of the land was cleared and plowed in the fall of 1906, while the remainder was prepared during the spring and summer of 1907. Owing to several causes very few crops were grown in 1907 and no definite results were obtained. It was in 1908 that banner crops were grown which presented as fine an appearance in the field as any grain grown by methods of either dry farming or irrigation. Some of the straw of the winter wheat was over five feet tall and heads of Silver King wheat seven inches long. It was a remarkable showing. Your secretary has made stereopticon views of several of these fields at Newcastle and you will have the opportunity this evening to judge personally, from the illustrations, the condition of this grown grain. The rainfall came at most opportune times to produce magnificent straw but at the end when the berries were filling out the ground lacked moisture and the yield was greatly decreased. Before this untimely drouth we had prospects of a yield of 40 or 50 bushels per acre.

Wheat.

"The Turkey Red wheat produced,, however, a little more than 22 bushels per acre, Red Cross wheat about 20 bushels, and Silver King wheat 20½ bushels per acre, beardless barley 22 2-3 bushels, Durum wheat 12¼ bushels and Defiance wheat 15 2-3 bushels per acre. On a plot, cropped the previous year with wheat, beardless barley produced 11 2-3 bushels per acre.

Alfalfa.

"The Newcastle farm has not been established long enough for us to draw any definite conclusions but the indications are that winter wheat ought to do well in that part of the state. The alfalfa has not been growing for a sufficient length of time to produce any crop for hay but it is doing remarkably well and ought to yield considerable hay another year.

Summer Fallow.

"At the Cheyenne farm we have undoubtedly shown that summer fallowing is one of the necessary factors in successful dry farming, and for this sort of agriculture the farmer must have more land for alternate annual plantings than the farmer who produces his crop under conditions of ample yearly moisture supply. In a practical way we discovered and showed at the Cheyenne farm the benefits of summer fallowing. It was while digging a trench for a pipe line in the spring of the year when the ground was still frozen. A portion of the trench passed through virgin prairie land and a portion through summer fallowed land. We found that in the former land the ground was frozen but six to eight inches deep, while in the latter it was frozen to a depth of over two feet. The depth of freezing depends of course upon the moisture content of the soil. Borings made with a soil auger tend to substantiate this phenomenon.

"As this office is carrying on irrigation investigations in connection with the dry farming experiments it will not be out of place for me to mention just one experiment to show the value of a little water applied at the right time.

Auxiliary Irrigation.

"In the fall of 1907, after a continued drouth and the ground was in a very dry condition our Mr. Gordon planted two adjoining plots to Turkey Red winter wheat at the same time under the same conditions, with the exception that one was irrigated with about six inches of water before plowing and preparing the seed bed, while the other received no water whatsoever. The plots were rotated from field peas in 1907. In the spring it was discovered that the plot which had not been irrigated was devoid of all vegetation and was afterwards plowed to prevent the growth of noxious weeds. The irrigated plot produced 33½ bushels of wheat per acre.

"These data have never been made public before this, but within the next few months we hope to have ready for distribution a bulletin announcing all the results of both the dry farmed and irrigation experiments, together with a description of all methods used, amount of seed sown per acre, et cetra. This pamphlet will be for free distribution and can be obtained by writing the United States Department of Agriculture, Washington, D. C."

Adjourned to 7:45 p. m.

Sixth Session, Wednesday Evening.

Garguilo's concert band gave a delightful program for one hour, beginning at 7:45 o'clock.

SECRETARY OF THE CONGRESS.

CHAIRMAN BOWMAN OF THE EXECUTIVE COMMITTEE (presiding): "The gentleman whom the Executive Committee has elected for Executive Secretary for the coming year is a gentleman who has rendered the dry farming movement more service and more good hard work than all of the rest of us put together. I speak of the Hon. John T. Burns."

DELEGATES: "Speech! Speech!"

MR. BURNS: "I thank you for this splendid reception, but not being an orator, I am going to do something better than to make a speech. The Board of Control has tried to have something doing all the time, something good, so we have prepared a little surprise for the people of Cheyenne. We are going to give you this fine band for two concerts for the benefit of the public of this city tomorrow, and we hope you will try, those of you who can, to hear these concerts. The first concert will be in Keefe hall from nine o'clock in the morning until 10:30, and if you have not already seen the exhibits you will find something that will forever silence those who think dry farming is a failure. We have there an exhibition of dry farming products that excels anything that has ever before been attempted, and which were gotten together under the most trying circumstances because of the lateness of the season, but through the careful work of the Board of Control and the Superintendent of the Exhibit, Dr. Cooke and Professor Olin of Colorado, the assembled exhibits are proof that dry farming certainly has made good. Tomorrow evening, through the kindness of the Board of Trustees of the Masonic Temple and the Board of Control of The Dry Farming Congress, you may have the pleasure of hearing Mr. Gargiulo and his famous band from 8:20 until 9:30 o'clock."

Dry Farm Exhibits.

OFFICIAL GREETING FROM BRAZIL.

MR. BOWMAN (presiding): "Ladies and Gentlemen. The Brazilian Government has sent to this country as its special representative Mr. Baeta-Neves. He comes with a special message to the United States from the Government of Brazil and he has an additional message for the city of Cheyenne. It gives me great pleasure to introduce to you the Brazilian special representative, Mr. Baeta-Neves.

SENOR BAETA-NEVES: "Your Excellency the Governor of Wyoming, and President of this Congress and Distinguished Members of this Congress: I take pleasure in coming again to this platform to say to you a very few words in an official capacity as delegate from the Republic of the United States of Brazil.

"Yesterday I came before you by myself as an especial delegate to this Congress by kind permission extended to me by your secretary, and now I come to bring greetings from my government to translate the thoughts and fraternal feelings of my whole nation, of the Brazilian people toward you, toward the younger nations here represented.

"My government, accepting the kind invitation extended to it by the Board of Control of this Congress, in order to be here represented, appointed me as its official representative before you according to the telegram received today by this Congress, from his Excellency Dr. Joanquin Nabuco, Brazilian Ambassador at Washington, and I am honored a second time in bringing the official greetings from Brazil to you, American people; the first time was at Albuquerque, New Mexico, during the Sixtieth National Irrigation Congress, and the second one now, in this not less important scientific convention.

"But this fact of being two times representative of my people in your scientific congresses does not signify at all, that we have not at home some one else to translate our fraternal feelings toward you and all American countries. It signifies that Brazil, receiving your invitation, had not time enough to send to you some one else who could better represent it, giving to you a better idea of the scientific attainment, the technical knowledge, politeness and refinement of my countrymen, proving to you what I have already said about our civilization.

"As I have said several times, I am not a standard of my people, I can only represent them as they are in the direction of duties.

"Ladies and Gentlemen, I believe that from my addresses yesterday, you can know how we Brazilians, in our national characteristics which is principally Americanism, according to the definition given by Dr. Joanquin Nabuco, appreciate your country.

"Many people say that we are very far from you in geographical distance, that is true; but they must know and I take pleasure in telling you again, that you are very near us in our thoughts. We Brazilians regard all American countries, and think of them with brotherly feelings, hoping for closer relations and friendship with them.

"Brazil can be considered as a second home of all people of our continent, and especially of the American people, and I am sure, by my own experience, that America is a second home of us Brazilians.

"I am entirely satisfied among you, appreciating your splendid hospitality, and I have not had time yet to be homesick and I sincerely do not believe that anybody could get homesick in this so hospitable country.

"I am going to finish, but before doing so, I wish to express to you my highest appreciation for your courtesy in electing me your vice-president for the next Dry Farming Congress. Certainly this is a great honor to my beloved Brazil, whose government extends to you its greetings, testifying its highest appreciation for the courteous invitation extended to it, and wishes a complete success to this Congress that it considers of international interest.

"I, therefore, in behalf of the United States of Brazil, present to you Americans, and to the distinguished representatives of foreign countries, its greetings, and best wishes for the most successful results of this Congress, and prosperity of all nations here represented."

Then Dr. Baeta-Neves paid high compliments to the state, Cheyenne, and American society, and afterwards took from his pocket a large silk Brazilian flag that he fondly unfolded and respectfully kissed, amid the hearty applauses of the assembly, that greeted him, highly appreciating his patriotic feelings and love for his native country. He described the beautiful flag giving the meaning of his national symbol, so full of significance, in the most beautiful and artistic combination of colors and emblems, and afterwards he presented the flag to Mayor Peter Cook, of Cheyenne, as representing the American families of that city. It was received by the mayor amid the most enthusiastic applause of the assembly.

DRY FARMING DEVELOPMENT.

Prof. F. B. Linfield, Director of the Experiment Station at Bozeman, Montana, gave an illustrated lecture, showing by photographic reproductions, the extent of dry farming development in the western states. He spoke as follows:

"Raising crops without irrigation in the semi-arid regions of the west is not a new practice, though an adequate realization of the great possibilities in this direction is new. From the evidence at hand the first

Utah Pioneers

attempts at farming the lands above the ditch was by the pioneers of Utah, some little cropping being done as early as the sixties but little development was made in this direction, however, till about 20 to 25 years ago.

Early Failures.

"It was about this same time that the rush of settlers spread themselves over the western parts of Kansas and Nebraska and out on the plains of Colorado, to be later driven back in large numbers by the dry seasons of 1893 to 1896. It was some ten years previous to this period that the farmers began taking up land in the comparatively humid districts west of the Rocky mountains, in eastern Washington, and northern Idaho and later they spread themselves westward towards the dryer sections of Washington and Oregon. Montana too made a start about twenty years ago, or soon after, in cropping the bench lands of the Gallatin valley.

"Twenty years ago a beginning was being made in dry farming in eastern Wyoming near the Black Hills. During this same period the settlers were gradually rolling themselves westward over the Dakotas. Thus from the evidence at hand it appears that the real earnest start in dry farming in various parts of the country began between 1880 to 1890. While in the great plains area thousands of farms were abandoned between 1893 to 1896, yet in other parts of the western country the extension and growth of dry farming has been substantial and ever forward. During all these years earnest men have been studying, practically and scientifically the problems of dry land agriculture.

Soil Treatment.

"The early workers on the bench farms in Utah soon learned to plow deep and to cultivate, to provide a reservoir for, and to retain the moisture. Experience gradually taught them that light seeding and cropping the land in alternate years gave the maximum crop from the dry land, though when the summer fallow practice started there is no record.

Campbell System.

"Out on the plains of Nebraska, Mr. W. H. Campbell refused to give up when his neighbors moved away. He believed the land had possibilities and he set himself diligently to work out a plan, a method of practice that would give successful crops. The results of his years of experiment made him out as a missionary to arouse the people to the opportunities offered.

Experiment Stations.

"As the work of the experiment stations has been primarily to solve the problems of the farmer rather than to promote the development of virgin agricultural fields, they have followed rather than led the work of the pioneer farmer.

"It appears that the first experiment farms in the dry country were started by the state of Colorado in the plains country in the eastern part of the state about 1894. As there were but little funds to either equip or maintain these stations they were abandoned four to five years ago.

Spread of the Movement.

"The gradual growth in the number and extent of the dry farms and the success attained under the best methods of practice aroused a general interest in this subject, which culminated in 1903 in a demand for thorough and scientific study of the problems of dry farm agriculture in the various districts. As a result of this aroused interest, the Utah legislature of 1903 appropriated $6,000 per year for six dry farm substations in various parts of that state. The same year the Nebraska legislature established a dry farm station at North Platte. Since that time North and South Dakota and Kansas have established stations on their dry western lands. About four years ago several stations, for the study of dry farm methods, were started in Montana, and one or two years later special studies were taken up in Wyoming. Other states have also started or contemplate starting work along this line.

Government Co-Operation.

"Meanwhile the United States Department of Agriculture has interested itself in this great problem and through its Bureau of Plant Industry and its Irrigation Division has taken up an extensive series of studies from north to south throughout the great plains area.

Dry Farming Congress.

"Finally there has come upon the scene this great organization, The Dry Farm Congress. When two years ago the people of Denver invited the people of the west to a Dry Farm Congress as a side attraction to their livestock show, they found they had stirred up a very live topic. The flood of enthusiastic dry farm delegates almost put the livestock show in the shade. The country awakened to the fact that dry farming was a live economic factor in the west and that its strongest advocates, the farmers on the land, were a successful and prosperous lot of people. The live and enthusiastic men in this convention were the dry land farmers.

The Second Congress.

"The Salt Lake Convention of a year ago added to the prestige of the Congress and emphasized the importance of dry farming to the west. The Congress justified itself as a clearing house of ideas, scientific and practical,—a place for exchanging experiences, for learning new methods, for analyzing theories and for comparing practices. The interest is growing and expanding. It has become national,— aye, world-wide in its scope, as we see from this the third Congress. May we prove equal to the responsibilities and limitations of dry farm agriculture in the west and placing this industry on a safe and proftable basis.

Rapid Development.

"It is not surprising that with all these factors engaged upon the dry farm problems, that there has been a rapid expansion of the practice of dry farming within the past five to eight years. The first decided movement out on the dry benches was by the western people themselves.

Immigration increasing.

"But a good thing could not long remain hid and for the past two or three years thousands of people from the east have been spreading themselves over this western country. Cheap land that has possibilities of successful and profitable cropping is yet, as it always has been, a most attractive inducement for the American people to move westward. It is being realized that this is the last chance for a free homestead. It is the last possible swarming of the people over the virgin territory of the United States. If our faith and experience is justified by the years, the next ten or fifteen years will see the tillable land of the United States pass wholly out of public into private ownership.

Conquering the Desert.

'The coming of the new settler is interesting to watch and to contemplate. He is conquering the desert by inches. Hurled back in the early 90's from a semi-arid country, he retreated defeated but not conquered. The gritty pioneer refused to move and has been working out on the dry farm, the dry land problem. He has called to his aid the scientists near and far, and now gradually with firmer and safer step is again traveling westward, conquering the desert as he comes. In our northern country a few push away out on the frontier, but the mass sit themselves down beside their neighbor, the settler of yesterday.

Frontier Changing.

"It was not many years ago that Devil's Lake in Northern Dakota, 200 miles from the Montana line, was considered the extreme western limit of possible agriculture. A few years later found the farmer at Minot, which has become a thriving city. Then as the years passed, we find Williston, the center of an agriculture country, with the lands farmed for miles around. Three years ago Montana looked an impossibility to the border farmer, but the next year found every quarter section of tillable land gone for 40 miles from the northern Montana, Dakota line. Culbertson became a thriving town and then it was on to Glasgow.

"This story has and is being repeated along the line of the Northern Pacific and also along the western line of the Milwaukee. At the present rate of coming, in five to eight years the new settler will have swept the state.

"To that extent this experience is being repeated in the states to the south, I do not know, but reports indicate that people have moved and are gradually moving westward over Nebraska, Kansas, Colorado and Wyoming. They are also pushing south into Texas, New Mexico and other states.

Dry Land Homesteads.

"The great majority of these people are taking hold of the dry lands because these are cheap, but the irrigated land is not forgotten and the increased number of people looking for homes on the land, or from a living from the land, is going to make it comparatively easy to settle the irrigated areas as soon as these are put upon the market.

"But as I stated, the great mass of these people are pushing out over the dry land. Is this a repetition of the western movement of 20 years ago, though more general in its scope, and are the experiences following that movement in any danger of re-appearing? This thought to me carries a weight of knowledge and energy at command to be given to working out the problems of dry farm agriculture, and carrying the information gained to the home of every settler. I believe we should know more about the possibilities and limitations of the various sections of our states, so that we may be able to advise intelligently as to the districts, and what conditions of soil and climate promise success, and what localities it would be well to pass by till our growth in knowledge and experience determine whether extensions to the less favored fields is desirable.

"We must all recognize that all of this western country is not alike. It varies much from east to west and from north to south; it varies with mountain and valley and plain and these varying sections each presents its problems.

Topographical Effects.

"In this semi-arid section of the country three general regions may be recognized: 1st, the plains region, extending from the 98 meridian to the mountain foot hills; 2nd, the intermountain region including the valleys and foothills of the mountain country; and 3rd, the coast region, beyond the Sierras. These regions vary in regard to their rainfall and other climatic conditions.

Plains Region

"The Plains Region gets its maximum rainfall during the months of April, May, June and July, one-half of the rainfall of the year coming in these months and frequently one-third of the rainfall of the year coming in May and June, or June and July. The rains are spasmodic and often come in heavy showers and torrental storms. More or less wind is generally blowing and the sun shines nearly 300 days in the year.

Coast Region.

"In the Coast region the rains come almost wholly in the winter season, and the late spring and early summer months are dry. There is, too, much more cloudy weather than in the plains region. There is little excessive heat and the nights generally bring dew.

Mountain Region.

"The intermountain region is somewhat intermediate between the Plains and Coast regions, some parts approaching the coast and other parts the plains region in the time and character of its rainfall. Again, in this region, the rainfall varies much in different localities and valleys. The higher plateaus and valleys generally get considerable more rain and snow than the lower valleys, and the foot hills more than the bottom lands. Generally the easterly side of the valley more than the western side. There are valleys in Montana when on one side the average rainfall is over 18 inches, while on the other side of the valley, 25 or 30 miles away, the average rainfall is not over 15 inches. I know a district where the wind has a full sweep for many miles unchecked by a mountain range and the rainfall is only ten to eleven inches per year; while not more than 50 miles away on the western slope of a mountain range, and some 1,000 feet higher in the air, the rainfall is 20 inches per year.

"In this intermountain region, too, the winds are not usually excessive, nor is the sun very hot as a rule, especially in the higher and more northern valleys.

Sunshine Effects.

"As I have thought and studied over this subject, it has appealed to me that another division of these regions may help us to appreciate better the problems to be solved, and so I would divide each of these regions into a northern and southern. To the north we find a cooler climate, with a relatively moister air, and thus less evaporation. The winds also are less frequent and generally blow from a northerly or westerly direction. There is also a longer summer day when the sun pours its energy to the plant life.

Evaporation.

"In the south the weather is hotter with a dry air, and thus evaporation is greater, while the summer sun daily shines for a shorter time. The winds blow mainly from a southerly direction and they blow more constantly and move more rapidly than in the northern country, thus drinking up the soil moisture with greater rapidity.

Precipitation.

"The results of these conditions is that the evaporation in the more southern part of these regions is nearly twice what it is in the more northern regions. It is therefore probable that 14 to 15 inches of annual precipitation in the northern region and in the higher valleys and plateaus of the mountain region is as valuable for crop growth as 18 to 20 inches in the more southern, the lower and more level country.

Climatic Effects.

"The varying conditions above mentioned will undoubtedly in time modify the kind of crops to be grown and the kind of soil management, and perhaps of farm practice, necessary to get the maximum returns in these various regions, and they must be considered in our plans and recommendations if the largest success is to be obtained in the development of dry land agriculture.

Dry Land Area.

"The amount of land that may be farmed without irrigation in this western country is not easy to determine at the present time and several years of observation and of study will probably be needed to define its limits. In Utah the estimate is ten to twenty million acres; in Colorado fifteen to twenty million; in Wyoming, about the same; in Idaho, five to ten million and in Montana fifteen to twenty million acres, and other western states about in proportion. There is need here for some actual survey work.

"Another interesting question as we look over the development of dry land agriculture is, what will be its tendencies? Will the development be along the line of establishing farm homes over the country with the individual farmer the unit of work and management, or will the tendency be toward the large farm where all modern economic forces will be used on the farm?

320 Acre Homestead.

"As the country is now settling up, the farmer is taking up his homestead and preparing to establish himself on the land, and it is probable that the 320-acre homestead on the bench lands will increase the desire to stay on the farm as it will promise larger remuneration and greater economy of management. This desire will also be helped by a more thorough knowledge and comprehension of how to make the home on these dry farms attractive and home-like. The possibility of growing both shade and fruit trees and of having a garden; the possibilities of a water supply for house and stock and also for irrigating the garden, and the knowledge of how to realize on these possibilities will do very much toward making the dry farms an attractive place to the home builder. However, there appears to be other tendencies at work.

Size of Farms.

"It is said that in the Pendleton district of Oregon, and in the Big Bend country in Washington, the tendency is for the small farmer to sell out to the large land owner. The tendency toward the large farm is also noticed in Utah, where, however, they take the form of co-operative farms, the land of several owners being thrown together to make one large tract which is then handled by large labor-saving machinery.

Improved Machinery.

"It is on these large farms where the steam or gasoline engine takes the place of horses in plowing, cultivating and seeding. In harvest time the same power pulls a combined harvester and thresher over the field and later draws the grain to market. The evidence at hand seems to indicate that this method of farm practice in grain growing on the large farm may cut the cost of production nearly in half as compared with horse power and the small machinery used on the small farm. In the dryer districts when water for household use is scarce and hard to get, these large outfits may profitably handle lands that could not be farmed successfully as a small farm and this may be where the large farm with large and powerful machinery may extend the borders of the dry land crop area beyond the abilities of the small holder and thus be a means of increasing immensely the crops and the wealth of the western country. There is room here for further investigation and study.

Stock Fattening.

"In the more favorable districts the small farmer has some advantage as he can take up a diversified agriculture. The production of animals and animal products on the farm and the feeding of the grain and fodder grown to the live stock of the farm will give a supply of manure which will add humus to the soil and maintain production at a higher level than on the exclusive grain farm, which the large farm is likely to be. I look therefore, for both types of farms to aid in the development of the country, each in time finding its appropriate fields. The large farm will develop in the more level and dryer districts and the smaller farm in the more rolling and better watered districts, as we find illustrated in the actual settlement of the country.

Immigration Increasing.

"The settler is moving out on the benches and into the valleys of this western country. The country is being rapidly homesteaded and even many large ranches are being divided up to satisfy the land hungry settler. The government irrigation projects and also various state and private irrigation enterprises are attracting their quarto of people.

"This is a farmer's immigration. They are after the treasures of the soil, as the first settlers were after the treasures of the placer gravel and of the mineralized rock. It means the second step in the development of the western states, and these states should use their best endeavors to bring this development to a successful issue, as with its fruition will come the next step, when the unlimited resources of water and coal and timber and mineral will be combined into immense manufacturing enterprises.

Necessity for Study.

"As I have studied on the ground this present movement of settlers, as I have met and talked with these people, as I have seen their homes and the circumstances by which they are surrounded, as I have read their letters of inquiry, I have questioned seriously whether the agencies already at work were not fully ample to make known the opportunities and resources of the state to outside people and whether the state could not, with the greatest advantage, give its money and the energies at its command to working out the many problems these new settlers have to face—problems which must be solved if they are to meet with success, with the new kind of farming in this new country. For whether they settle on the dry farm above or on the irrigated farm below the ditch, there is here a new farm practice as compared to the humid districts of the east.

Causes of Failures.

"The man who follows eastern methods, who does not handle his soil and crop according to approved dry farm methods ,who does not understand fully the great importance of certain methods of practice and carry them out fully, is doomed to fail on the dry farm, should a succession of dry years come.

Irrigation Farmer's Problem.

"The new-comer on the irrigated farm has also a very serious problem, especially if his means are limited. To the man with limited capital and no experience in irrigation, it is no small undertakng to work out success on an irrigated farm, even under the government projects. With an 80-acre farm he will have to raise from $200 to $320 in cash each year top pay for the ditch. At the same time the land has to be broken and fenced, house, barn and stables built, horses and machinery provided and the family kept. At the same time the community needs have to be met; roads and bridges built, schools, churches and the municipal building to be provided. The man and the community who can do all these things and do them well, must crop all that 80 acre farm and get it to produce a maximum return.

Experiment Station.

"On every irrigated project and in every dry farm community there should be a demonstration and experimental farm established for a few years; a place where the local crop problem should be studied; where the people could see how the work should be done and from which an instructor may be sent out to show how success may be obtained. These should be temporary stations, as in a few years they would be transferred to another place in need of such instruction.

State Co-Operation.

"If the state desires to increase its agricultural population, the great problem that demands attention for the next few years is to show the many people who are already here and the very many more that are certainly coming, how they may succeed under the new climatic conditions that they here must meet with. A successful, prosperous and satisfied settler is the best kind of an advertiser ,whereas the failure due to improper methods of farm practice will do more to keep the settler out and to move them out than many thousand of dollars could do to bring them in.

"If my observations and inquiries rightly inform me, the farm settlers are coming to the west just as fast, if not faster, than they can be helped to a right understanding of the farm methods that are necessary to success, so that if the states have any funds to devote to the settlement of the country, it should go into helping those who are here, to succeed, rather than in inducing others to come. The fact that the states are taking hold of this problem will in itself be the greatest kind of an inducement to settlers to come."

One hundred and twenty descriptive stereopticon slides were then used to show actual crop distributions.

The Congress adjourned to Turner Hall, where a smoker was given for delegates.

Seventh Session, Thursday Morning.

The Congress was called to order at nine thirty o'clock, by Hon. Bryant B. Brooks, presiding.

SENATOR McCOLL: "I have a few words to say this morning, and I hope I won't be deemed burdensome in saying them, or interfering beyond what is right regarding the proceedings of this Congress. We have all come a long way and we want to get all we can. Now, I am afraid some of us are going home with not quite all we should get.. Now, I recognize the splendid work that has been done by the Government stations and Government officials, and the gentlemen who have addressed this Congress, but I am in time to state that there are too many official papers and too little of discussion, there is too much speculation and theory and too little practical results. I am going to make a suggestion for these meetings. It is not in my hands, but I want to do what I think is best not only for this Congress, but for future Congresses. There are a number of farmers here and we would like to hear from them. The experiment stations and officials are doing a magnificent work, but they don't do it for themselves, they do it for the farmers, and what we want to know what the farmers have done with the example the experiment stations have set. I want to suggest, even if we do have to prolong this Congress, that we shall have what our friends the Methodists call an experience meeting, and we will have it thrown open for the farmers to come and tell their experiences. Not only their successes, but their failures, as we learn far more from our failures than from our successes. Now, I want to make this suggestion to our friends, the government officials, and I do it with all respect, and not wishing to interfere in any way that we should have before we part, one two, three or four hours for free, open discussion where any man can come and tell his experiences, tell something he has learned himself and we may go home all the wiser and all the better, and more familiar with the things that have sent us here."

SCIENTIFIC AGRICULTURE.

GOVERNOR BROOKS (Presiding): The suggestions made by the senator from Australia are certainly very timely, and we will have a little discussion after the papers this morning, depending somewhat upon the time which we have at our disposal this afternoon. I am going to call upon the father of the arid land movement of the dry farming work to now address us upon "Scientific Agriculture; Its Effects on the West." Professor H. M. Campbell.

PROFESSOR CAMPBELL: "While sitting here yesterday and listening to some of the remarks, I couldn't help but think of the number of years ago when I came to the conclusion that better results might be obtained out of a certain system of tillage if we could only understand how to advance these ideas, but I was discredited by everybody. I don't know that any man acquiesed in my suggestions in my early work. I have gone on single handed. I have not been backed by the Treasury of the Government, by the state, or the railroads. I have overcome some inconveniences, but I have kept steadily at it, until I have reached some conclusions that I know are correct, notwithstanding any contradiction of the soil and bring results. It is not confined to mechanical work. It is whatever. I know there are principles that we can follow in the tillage impossible to tell you that you shall plow a certain depth, that you shall use a sub-surface packer, and thereby get results.

Necessity for Study.

"You must, however, understand certain physical conditions of the soil, which must be obtained if you get results. There are many theories advanced and many systems, so-called, mentioned, but mark you, gentlemen, every one of them when applied to the soil bring results just in proportion to the nearness with which they reach that certain physical condition of the soil.

Soil Treatment.

"For better words to explain, I will emphasize in this way, that to get results from our soil, no matter where, in Illinois, the New England States, semi-arid, or by irrigation, the result in growing crops depends on the soil cultivation by which we can use air and water. Air is just as necessary as water, but they must be there in the proper quantities.

Sub Surface Packer.

"In our process of work we have devised what is called a sub-surface packer. The first one built was in 1885 in a blacksmith shop in South Dakota, and last December in the State of Washington, I actually met that same device. That device was not a success, except to demonstrate that there was a correctness in the principle. It was simply in form a spring tooth harrow with teeth made of 1-4x7-8 inch steel and drawn back. The idea was that with the weight on top, the individual teeth would pack the loose places and packing over the under portion of the soil is absolutely necessary. When you plow your ground deeply and you simply work the surface with the harrow or common tools used, and do not work that under portion and get that down firm, your crop is a failure, if you have a dry season. It is just in proportion to the season.

Soil Mulch.

"A man who settles his ground in this way, who has an irrigation ditch to turn loose, may dissolve that under portion, but the crop will depend on the condition he leaves the top in. If he doesn't loosen it up to admit the air as well as to conserve the water, he will not get the best possible results. When we recognize the fact that the average yield

Wheat Averages.

of wheat in the majority of states east of the Rockies ranges from 13 to 15 bushels, and then recognize the fact that as high as 67 bushels have been grown in Nebraska by thorough, systematic work; that a gentleman in Alberta has produced 67½ and another 63½ following the lines we have endeavored to lay down in a little book, there is some evidence of the correctness of those principles. Now let me emphasize again. I am not going to take up the mechanical part of this work, the time is too short, but I want to emphasize again, the importance of the physical condition of the soil. You have all noticed in dry seasons the effect of a wagon track or a horse's hoof track. Now why is that? There are several reasons why. By crowding that part hardest together it decreases the air holding and increases the water holding capacity. The air must be there with the water and in the proper quantities. Gentlemen: I have prepared a paper, but I shall not read it. I feel more good can be brought out of this by discussing the pros and cons and the experiences of the people who are attempting to carry out scientific principles. I just want to touch on one point. That refers to the name of this Congress.

Dry Farming a Misnomer.

"I think it is a woeful mistake that it happened to catch the name of dry farming, for dry farming means nothing, or in other words, it means one thing in one place and another thing in another. My suggestion is Scientific Farmer's Congress. Let it include farmers in all sections of the country. Take the irrigator today and he is just beginning to discover that he is using altogether too much water, and if he used less water with more scientific cultivation, the results would be far better. I would like to relate a few little instances that come under my observation in traveling over the country. One party down in Texas just to show you how easy it is for a man to be mistaken or to get a misconception of the meaning of some things—a judge at Herford, Texas, became very much interested in the work four years ago and started out on a section close to town to do work by our process Each year he got a little better results.

Acreage Yields.

"Last year was a very unfavorable season down there, but he secured 36 bushels of wheat to the acre. A neighbor of his, there was an imaginery line between them, started out with the idea of beating the Judge because he had farmed all his life, but when the harvest of the two fields came, the neighbor's field yielded 12 bushels, practically one-third of what the Judge's did. He came to the Judge and said: 'I cannot understand it; I kept close tab on my work and I have done a little more than 50 per cent more labor on my field than you have on yours, and I have sown twice as much seed as you did and I only have one-third of the result.' That shows there is a time to do these things and that certain principles must be adhered to.

"To go on premises and do a whole lot of work as a great many people think we do is a mistake. It is not the increased amount of labor that brings results, but it is doing what we do in the right way at the right time. Another instance up in Canada last year. It was our second trip through Alberta delivering a series of lectures. At one of the meetings a gentleman arose, and said: "Mr. Campbell, I heard your lecture last year and obtained one of your books. I have followed your instructions to the letter, and I havn't as good crops as my neighbor who didn't follow it; now what was the matter?" I said: "My friend, I will have to ask you a few questions. What did you do after you broke your ground?" "I double disked it." "Can you find in our book, or did you listen to any remark in our address that suggested double discing the sod after it was turned over?" "Why, yes." "No, sir, it isn't there. I recommended the disc in several instances, but never on ground in that condition.

Soil Treatment

'He had turned his sod over and then in order to do good work he double disked it. What does that do? It cuts it up in little lumps. Now the plow turns under about three inches of good new soil and puts those lumps down under, and all the discs you could put over it couldn't obliterate the air spaces so as to develop nitrification because of too much air. I could relate to you dozens of instances of this same kind. Another instance which happened near Holburn, where a man had prepared a piece of ground by thorough tillage. He had grown a crop that was apparently 50 to 100 per cent better than his neighbors, and he remarked: 'I am going to follow your plan.' There is one thing I urge and that is to double disc the ground as quickly as possible after the crop is taken off. This gentleman hired two discs and had them follow the harvesters. The threshing was done in about two weeks when he began to plow. He plowed about five rods wide and followed the plow with sub surface packer and followed that with the harrow. At this junction he was called away and a number of weeks elapsed before anything further was done. This would be from the middle of July to the middle of August. The result was an enormous growth of weeds on the ground that had been plowed.

"He came back and used the same plow, used the same depth, followed the plow with the sub-surface packer and followed that with the harrow, just the same as he had done at first. After the entire field was plowed there came on top of this a gentle all-day drizzling rain. The following afternoon the surface was just right to harrow. The field had a uniform appearance and it was seeded with 25 pounds of seed.

Results of Methodical Work.

"Myself and two other gentlemen examined that land at harvest time the next year and it was our uniform opinion that the part plowed first would go 50 bushels, while the part plowed last would go 20. Gentlemen, I relate this to show you the importance of following lines. What was the difficulty? Was it because he turned under the weeds? No sir, that cut very little figure. It was because the weeds were allowed to grow and extract from the soil the moisture and deposit it so that when the plow went in it broke it up in lumps and when the packer went over it, it made smaller lumps, yet it didn't have that condition where the nitrates might be developed.

"I just mentioned these to show you if you carry out proper ideas there is no difficulty in growing good crops every time, but if we proceed as a great many have done, who have come into the semi-arid belt, and we get some of our old fashioned ideas, there is going to be trouble, there is no use talking. There is no successful farming in the semi-arid belt by following the old plans adopted in the east.

Causes of Failure.

'This Autumn I visited two or three sections where a number of people had given up in disgust and gone back East simply because they didn't know how. In the extreme west end of Oklahoma, on a strip of the panhandle, is a gentleman who carried our plan out to quite a degree and produced 38 bushels of wheat to the acre, where his neighbors were packing up and getting out of the country because they got nothing. He said to me that frequently they would stop at his well—that was the early part of last year—to water their teams and sometimes camp, and he said it was a common remark: 'If only we had wheat like that we would have stayed on our place.' One man knew how, the other didn't. Gentlemen, are there any questions?"

DR. COOKE. "How much moisture did you receive when you got 67 bushels to the acre?"

PROF. CAMPBELL: "Mr. Burnett will have to answer that question as I am not familiar with the conditions at all."

Precipitation.

MR. BURNETT: "The 67 bushels was the 1908 yield and we had 19 inches of rainfall. 15 inches between March and the 1st of August."

Summer Fallow.

DR. COOKE: "Was that summer tilled land?"

MR. BURNETT: "Summer tilled in 1907. In 1907 we had a little more rain fall than in 1908, but both were very near normal, about 19 inches."

DR. COOKE: "Nineteen inches during summer fallow?"

MR. BURNETT: "Some of that after the crop was harvested."

Soil Treatment.

PROF. JARDINE: "What difference did you make in the preparation of your land when you plowed in the fall and when you plowed in the spring? A great many farmers believe in plowing in the fall."

PROF. CAMPBELL: "I don't know as that would make and particular difference. One thing we adhere to, not to plow unless the ground is in condition to plow. This subject was touched on yesterday I could relate an experience that occurred a great many years ago, that perhaps might throw some light on the subject. In 1882, in South Dakota, we had the most ideal season I think I ever experienced anywhere and 40 bushels of spring wheat was quite common, not because any of us knew how to farm, but because we were favored with conditions that were just right. We happened to get ideal conditions. Just before the harvesting of this crop, we had our last rain fall and no rain during the autumn whatever. At stacking time it was the hotest weather I ever experienced in that country. At noon one day I was on top of a stack, ten or twelve fee high, and I climbed up on that same stack after dinner and I had to give the work up, it was too hot. We had a great deal of wind that autumn. Three hundred acres we had in wheat and 260 acres we plowed that fall, and the following spring we plowed 40 acres, the balance. The 260 acres gave practically no crop at all, while the 40 acres gave us a very good crop. We had a little consultation among the neighbors on the question, which to us was very complex, and we decided one of two things must be true. We were wearing out the soil very fast or spring plowing was the proper thing, consequently a portion of the ground was left over the next year. The next year our best crop was on the fall plowing and our poorest crop on the spring plowing. A common remark among the neighbors at that time was, the longer we stay here the less we know about it, and it was a good many years before we found out the difficulty. Had it not been for a diary kept by my mother, I doubt if we would have ever known. I went back to this old diary and I found this: In 1882, in the autumn, there was no rain but during the winter we had considerable snow. That snow went off in the spring with a long rain, consequently the ground was wet to a good depth.

Soil Treatment.

"As soon as the ground was in condition to plow we began plowing 40 acres in two 20-acre pieces. We followed immediately with the harrow and the seeding of that piece was done right away and harrowed again, consequently the ground that was moist in the spring went all to pieces. The harrow worked it down, going over it with the harrow previous to seeding, and harrowing after seeding, while the ground plowed in the fall broke up lumpy and full of little cavaties underneath; it was not an uncommon thing to look down and see rows of wheat, which, on investigation, showed that it was nothing but the horse's hoof that caused it. The following autumn we had abundant rain and the ground was moist, consequently the fall plowing was done when conditions were better and it went through in nice shape. The winter was an open winter, freezing and thawing all winter and windy and dry in the spring, and when we got to plowing in the spring the ground was dry; that is the secret of the whole thing. This little illustration means a great deal.

PROF. JARDINE: "Then I understand you Mr. Campbell in the autumn you plowed the land and in the fall it was very dry?"

PROF. CAMPBELL: "Yes, sir."

PROF. JARDINE: "You had snow on the ground in the winter?"

PROF. CAMPBELL: "Yes, sir."

PROF. JARDINE: "You plowed the land in the spring and it was in good condition in the spring?"

PROF. CAMPBELL: "Yes, sir."

PROF. JARDINE: "And you got good crops in the spring plowing and poor crops from the autumn plowing of the land?"

PROF. CAMPBELL: "Yes, sir."

PROF. JARDINE: "Of course, you are familiar with farming in the mountains?"

PROF. CAMPBELL: "Somewhat."

Soil Treatment.

PROF. JARDINE: "Of course, you know that farming out there is based on fall plowing, don't you? It is, if you don't know it, and plowing out there is always done in the fall. Of course, there is no one disputes the fact that good plowing can be done when the soil is in the right moisture condition, but when you can get that condition in the fall, it is always preferable, so a great many of our farmers in the mountain region are turning their land over in big lumps and leaving it open, and I want to say right here—Senator McColl has referred to us as 'Station men'—I want to speak now from a farmer's view, because I am operating one of the biggest farms in the country. Our land goes into winter conditions in bug lumps. We don't say the lumpy condition is better; we would like to have it smooth, but we would never put a harrow or disc on it.

Conserving Moisture.

"We want it open and loose like a sponge, so that it will absorb all the moisture and so that the snow will sink down and act on the soil, irrigate it and give it life. If we plow our land in the spring ,moist or otherwise, the probable difference is 20 to 50 per cent. Gentlemen, I wish you to remember that this is simply one illustration of Prof. Campbell, and I think it is very serious to draw conclusions from one illustration. In the country through the mountain regions especially in Utah—I don't think any one can question the good work that has been done in Utah—on possibly a less amount of rain fall than you get in any arid farm state, farming is done on the basis of winter plowing, and I believe there isn't a farmer here from Utah but what will swear by this statement. I believe there isn't a farmer out there but what will agree with me. My field goes into winter condition in a lumpy condition. I am not saying that is the best, but we would prefer having it go into winter in a lumpy condition rather than leaving it go until spring. Now if spring plowing is the best in the plains regions, it only illustrates the fact that we cannot make sweeping statements covering all countries. We absolutely know in the mountains that we have got to plow in the fall.

Soil Treatment.

"PROF. CAMPBELL: "You heard the Gentleman's criticism. It was my attempt when I got on the floor to rivet your minds on one thing, and that was that a certain physical condition of the soil was necessary and I don't care how you go ahead to get it. In the illustrations that were brought out with reference to plowing in South Dakota, they simply brought out that same point to view, that in plowing our ground there when it dry and would break up lumpy, that it was impossible to get that physical condition. I know that over the other side of the mountain they have soil quite different from ours, whether it is true where the gentleman has reference to, I don't know, but the soil over there, a large volume of it, dissolves readily with water, very much more so than our class of soil on this side of the mountains. It is true, and I have not attempted—although I may have been so understood—to give you to understand that there were certain mechanical rules which applied everywhere. No, sir. I endeavored to make that statement on the start. That is, get your efforts to one point, get the fine ideal condition in which the proper quantities of air and water are mixed. I may not be correct in stating this.

Conservation of Moisture.

"You get the soil in a fine ideal condition where it carries just the proper quantity of water and the root system is perfect and it will let the roots run out and gather in the plant food and moisture. In that ideal condition you carry the greatest amount of water possible. The greatest trouble with us on this side of the mountain is to carry us through the long dry spells and we must do everything we can to make it possible to feed the plant all the time. All it needs is this fine soil which carries the largest per cent of water and the water is increased by crowding the parts together. You take soil that is somewhat loose and put the seed in and it will come up and perhaps send out one, two or three shoots, while if seed is put in soil which is fine and firm it will send out a dozen or twenty; in fact, I have seen as high as 102 stalks from one kearnel of wheat, all bearing good seed. Gentlemen, I don't come here for any quarrel with anybody. I came here with an honest purpose. I have done all my work with honest intentions. When I started in in Dakota, I had no idea I would ever stand before an audience to tell them what I had accomplished and what I had discovered. I have been using a combination of conditions, but I went on and on in the work until I became enthusiastic. In 1894 I think it was the worst year we ever had and I produced very remarkable results in potatoes and a small piece of wheat, and it was so remarkable that it attracted the attention of the railroads and I was invited by the Northern Pacific to go and put some experiments on their farms. At first I said 'no,' but finally consented. Then I was asked to go over their line and make addresses. I said 'no, I can't do that; I never talked to an audience in my life; but I have gone on by degrees watching each step and watching the bulletins which came out from the colleges and departments at Washington. I have gone from the gulf to Alberta and I have been all over the Pacific Coast and I want to say to you that two weeks spent in the State of Washington instructed me along this line as much as any two weeks I ever had; yes, two months. You find a difference in the physical conditions. It shows a natural physical condition that may be assumed by any ordinary tillage and the results of a little rainfall, a condition you cannot get in this country."

MR. McCANE, South Dakota: "I want to ask if you won't indulge us for a few moments on this subject, that Dr. Campbell was discussing; if so, I will ask one question; have I the right?"

GOV. BROOKS, (presiding): "We must get through with this program. I am anxious to be fair with Prof. Campbell but the other speakers on the program this morning must have an opportunity to be heard. Knowing your deep interest in Prof. Campbell's work and your deep appreciation of what he has accomplished in the past in the development of this dry farming movement, I will consent to five minutes more with Prof. Campbell."

MR. McCANE, South Dakota: "I just want to say a few words regarding this, because I think something is left unfinished here and will leave a wrong impression on the minds of some of the delegates. I was battling under the same conditions in the western end of the state in 1883, up to 1896, still wishing that the next year would be a good crop year and hoping that the conditions of the present year would be enough to conserve the moisture to carry us over for use for the next season's crop. Now, was it not on account of the snow drifting off of the fall plowed land, and lodging on the 40 acres plowed in the spring, that showed this condition and this result in the crop of 1882?"

Precipitation.

PROF. CAMPBELL: "It was undoubtedly true; sometimes just a little bit more water would carry us over those critical times and in case of the drifting of snow into the stubble; that might have been true."

Soil Treatment.

MR. McCANE, South Dakota: "What is the best time to break up virgin soil?"

PROF. CAMPBELL: "When you get ready, but be sure the ground is in condition to plow."

Land Fertilization.

MR. RICH: "A good deal is said about manure; can manure be put on this dry land?"

PROF. CAMPBELL: "Yes, but be as economical with it as you would be in the eastern states, not because the soil isn't fertile, but because the more humus you get in the soil, the more easy it will be to till the soil and get water into it."

Effect of Altitude.

MR. KETCHEL, Laramie: "What in your opinion is the influence that altitude might have on this system of farming."

PROF. CAMPBELL: "I don't know as I have observed any special difference. Of course, altitude has something to do with the crop. It is undoubtedly true that some crops do much better in a high altitude than in a lower altitude, but the same fundamental principles are true everywhere. I don't want you to go away and say I have been telling you of certain mechanical work to be done, but I want you to go away with the idea that the soil must be gotten into a certain physical condition in order to get results. In the application of manure the way it used to be done, turned under and left open, it was a detriment, but if it is disked into the top, turned under and packed down, it will bring results."

Soil Treatment.

A DELEGATE, Wyoming: "I would like to know the gentleman's experience in fall plowing, by plowing it again in the spring?"

PROF. CAMPBELL: "I wouldn't do it. Ground plowed in the fall I wouldn't plow again in the spring. I don't think it was necessary, and many insist that it would be a disadvantage."

Irrigation.

A DELEGATE, Wyoming: "In irrigating a field that year, can you use water if necessary?"

PROF. CAMPBELL: "That is quite different, because where you have plenty of water to turn on, you can get that farm in condition and have water in the soil, while in localities where you have not irrigation in handling the soil, you are liable to dry it more or less, and the movement of water below is very slow until it gets very firm, consequently you haven't the ideal condition to bring up the seed, but in fall plowing which I favor, you have got the condition and ought to have it if you double disc to prevent loss of moisture."

Soil Treatment for Soil.

PROF. TINSLEY, New Mexico: "I would like to ask if you have found any preference between corn and wheat as to compactness in the seed bed; that is, whether corn will flourish in a seed bed that would be rather loose for small grains?"

PROF. CAMPBELL: "No, sir, I have not observed any particular points along that line, but I would say in that connection that the same conditions would be favorable to corn, that would be favorable to wheat. It is possible corn might survive in loose soil, to better advantage than wheat because of its being a larger root, but I believe the same fundamental principles apply. Permit me to reiterate one instance which was told me in Canada in which a gentleman said that he seeded his ground in the spring for spring wheat and left three acres to be put into sugar beets. After seeding the ground he harrowed it with a three-horse harrow and then there came a little rain and the weeds started and he gave it another harrow with the same outcome; still the situation was no better, so he got a disc and harrowed it again in the same way and seeded it with a drill. The situation was exactly as it was when he seeded the first of it, but now this was last June and the wheat he put in three weeks later is six inches higher than the other; now, why? The horses packed the ground.

Land Fertilization.

A DELEGATE, South Dakota: "I would like to ask if you maintain that we can go along for an indefinite period by bringing about this physical condition in the soil without manure; that is, if you maintain that the soil will keep responding and yielding crops without being absolutely renewed with humus?"

PROF. CAMPBELL: "So far as we have gone, we have not discovered any deterioration, where the work has been properly done, and we have produced very large results. My idea is to keep on in this way until you discover that it is deteriorating. It may and it may not, I couldn't answer the question definitely."

GOV. BROOKS (presiding): "If we have time later on, we will be very glad to continue this discussion with Prof. Campbell. In this great work in which we are all so vitally interested, it is possibly well for up to pause a moment and listen to someone who has had years of experience reaching back to the days before some in this audience were born, and it gives me much pleasure to introduce to you Hon. John Henry Smith, who has devoted his life to development work in the west, and who will address you."

DEVELOPMENT OF THE WEST.

By Hon. John Henry Smith, of Salt Lake City, Utah.

"Ladies and Gentlemen: It is a very great pleasure for me to be in attendance on this third session of The Dry Farming Congress, having taken a most intense interest in the gatherings of the Trans-Mississippi Congress, the Irrigation Congress, the cattle congresses, and the good roads congresses, and several other congresses in our country.

"The development of this western land has been a wonderful thing to me, for I have seen its development from the tallow tip to the electric light; from carrying our goods by ox teams and burrows to its being transported by railroad, steam engine and electric car. I have had pleasure in following its wonderful growth, and I know the possibilities within the reach of every American boy and girl, who should become impressed with that utterance given years ago by the editor of The New York Tribune, Go West, young man, and grow up with the country.'

"The visits of the Catholic fathers among the native races of the world, their heroic efforts looking to the development and uplift of that class of people, and their researches and travels in the land, give a place to them among the bravest and noblest among men who have fought for the betterment of their kind. But from the days of John C. Fremont when he made his wonderful trip across this land, visiting every section of our country, going through to the Pacific coast, and enduring the hardships incident to that trip, his visit to many sections of the land shows the impression that was left by his work. As also, the travels of Lewis and Clark, as they wended their way across this continent and found themselves in this western land in the most beautiful section of this world of ours. Following in their wake were the people of my own race, Brigham Young and his associates, among whom were my grandfather and father, who passed through this section of the country in 1847, my father returning to the frontier at Council Bluffs that year, and my old grandfather having charge of the fort established in Salt Lake City, while Brigham Young and the others returned to the east that they might lead other colonists into that section of our land. It was not my good fortune to have been born until 1848, but during the summer of 1849 in the company of my parents I wended my way across this continent and took the first step I was ever known to take by myself standing at the side of a wagon tongue on the banks of the Green river. From that day until the present in the development and growth of this great land of ours it has ever been a joy to me in noting the movements and efforts necessary to the conquering of the soil, and our first efforts in Utah were very crude ones, for we had no knowledge

Irrigation.

in regard to this question of irrigation. The results of those first efforts were such that the grain was grown on the ground, became so full and big after having been covered with water that it was necessary to pull up the grain by the roots and thresh it out with flails,—and the result of this condition was such that the grain itself was badly mixed with dirt and didn't afford the best class of food.

Utah Development.

"The growth and development of Utah, and Utah then comprehended a large portion of our country, was a constant struggle with the elements to secure that which was necessary to our good. The flights of grasshoppers over the land and destroying our crops, reduced the people almost to death's door. Strong and stalwart men staggered to their work in their effort to secure a little food for their children, and I remember one of these experiences when but a child that the food that was eaten in my mother's home was simply bran porridge, and when the children were compelled to live upon this class of food you can readily comprehend the straits to which mothers of families and fathers of families were reduced. But there came a change. The spirit of improvement, the onward movement possessed the people of that section and the discovery of gold in the west by Mr. Marshall and his associates. Among his associates who were digging back there were members of my own faith, who had gone to the west and who endured the experiences necessary to that travel from the coast to New Mexico and Arizona and into southern California, and it is said a man by the name of Bigler threw out the first of that metal which Marshall recognized as gold and announced his wonderful discovery to the world. The flight to the land by miners seeking the phantom gold was a relief to the western country, and especially I believe to the people of my own faith, for in many instances having reached that point where they were convinced that it was impossible to raise a crop at the time of year they were there, many disposed of their outfits, horses and wagons, or exchanged their horses for horses that were in better flesh and pushed on that they might be early in securing the blessings to be found in that section of the world. That movement, started in motion as it was under the spirit of the securing of gold, has proven to the people of the United States and the world at large one of the greatest blessings to mankind—the development of this western land.

"There came the day when the railroads began their development work in the laying of their rails, and it was my lot to have a little part in the construction of the Central Pacific, working under the direction of such men as Leland Stanford, of California, one of the greatest men I have ever known. But among the heroes of our times are to be found men who established themselves in mines, upon rances, and who made every effort possible to establish and build up the country in which they had established themselves.

"Women were as heroic as the men, in the establishment of many colonies in my own section of the country, had it not been for the stalwart determined purpose of heroic women, the sections that their husbands had set apart to establish homes on would have been failures. I call to mind at the present time an old lady who died a few years ago in one of the southern settlements of our state, who when her husband said to her: 'I can't endure this any longer. I will withdraw from this section and pull myself back north.' She said: 'My husband, if you go, you go alone. I believe this is the chosen land. I believe the possibilities within the reach of this people are beyond compare. Here I have planted my tent in your companionship, and here under the providence of God I propose to stay and see success perch on this effort and the building of this western land.' Such were the characteristics of the men and such the characteristics of the women who laid the foundations of these walls and established these states and territories that have proven to us such boons. They possessed the elements of the highest possible character. They were fearless, determined and industrious in taking their part in the accomplishment of every work. All honor to every one of them, whether Pagan or Jew, whether Christian or Pagan, no matter from whence they came, the same heroic mold and makeup have been characteristics of those who have established themselves within the confines of this glorious western land of ours.

"No more sturdy, devoted, fearless and earnest man could be found than Brigham Young, who led the Mormon people into the valleys of Utah. I was as intimate with him as any child could be with their father, living but just across the street, and being in his companionship constantly, hearing his views, understanding his ideas, and recognizing his purposes, I know the efforts that he sought to make for the development of his own section, and while making those efforts for the upbuilding of his own section, his heart was alive to the interest of his countrymen everywhere so far as their betterment was concerned. Among that first pioneer band that broke through the mountain vales and gazed upon the waters of the great Salt Lake were found people not members of the Mormon church, but who lived among that people and whose children grew up with the Mormon children, and who were citizens of worth in the community where they resided.

Railroad Development.

"In speaking to you of the development of the west I glory in the evidence of that determination and that will that has inspired our railroad people in the development of the sections through which their roads have gone, and I believe the grand men who laid the foundations for this work are entitled to the esteem, respect and regard of their countrymen. It is an easy thing for the child legislators of today to propose more methods for the control and management of these great corporations, but they are but children in the considerations of these problems in comparison with these men who have developed these great works and who have been heroes among men, and their accomplishment entitles them to the respect, esteem and regard of their country, and not their reproach and hate.

"The day of the Trans-Mississippi Commercial Congress came, when the feeling and sentiment in the hearts of western men was that we were not receiving proper consideration in the Congress of the United States; that our brothers of the east were devoting the means to the improvement of the harbors and rivers of the east, and that the western section of the country could not receive appropriations and help along proper lines, in the judgment of some of us. This led to the organization of the Trans-Mississippi Commercial Congress which brought together representatives from these various states and territories and united their minds in the accomplishment of their purpose. The formation of the Trans-Mississippi Commercial Congress was speedily followed by the organization of the International Irrigation Congress, and it aided in the accomplishment of this work, and step by step, the hearts of these men were brought into unison with each other and lead to the establishment of rules and regulations, and passing of resolutions, the organization of committees, and the leading men of the west commenced to sense the possibilities of their power and work for the uplifting and betterment of the land in which they had planted their homes. The results we are beginning to note in the irrigation successes and in the improvements that have occurred in various sections of our country looking for the well being and useful application of means for the good of the citizenship of this part of the world. The awakening of this dry land scheme looking to the improvement of those great sections of our country was another step in the direction of that improvement and in the uplift of the race, in the betterment of men, in placing homes within the reach of their fellows, that has brought results and the results increase in worth as the days go by, until in every section of this arid part of the world will be found men and women so fully given over to the betterment of their country that they will be indeed a blessing to our race in the fullest sense of the word.

"Now, my friends, I am not myself an arid farmer, but I love this western land. I love the great plains. I saw the buffalo on the plains and the Indian tribes in my infancy, and as time has gone on the buffalo has disappeared and cattle and sheep on a thousand hills have taken their place, and millions of men have drifted into possession of these soils, builded their homes, established their business, reclaimed the desert and made it to blossom as the rose. I say of that grand body of men and women of all races and creeds, and all who love liberty for themselves and for their fellows, may the blessings of Almighty God abound in their hearts and in their homes, and may the millions who follow us into this western land be awakened to that pride, ambition and determination that their state shall be first and foremost among the states in the perpetuation of all that is good and the avoidance if all that is small, mean and little. May that people who have reclaimed this land plants the standard upon these mountain sides, open their canals into these valleys, establish their plantations, themselves have full enjoyment of their efforts, and may rejoice in the thought, as I do today, that I remember the disappearance of the tallow dip which was replaced by the tallow candle and in its place the lamp lighted with oil; the disappearance of the oil lamp and the coming of the gas jet, and later the illuminations by electricity; as well as the movement of the burro to the ox team; of the stage coach to the car, and finally these electric cars carrying themselves around our country.

"May blessings abound in the homes of these men and women for their sturdy worth. May we fully appreciate the possibilities of this glorous western land from which gold, silver and iron and from which the golden grain and fruit and everything which tends to provide for the needs and wants of man have been so plentifully supplied; that they may continue; that they shall have the same enjoyment and the same pleasure and secure the same satisfaction in their efforts and labors."

THE FOURTH CONGRESS

GOVERNOR BROOKS: (presiding): "I was just informed by the Secretary that it was made a special order of business yesterday for 11 o'clock today, for selection of the place for holding the next Congress. The hour has arrived and that order will be carried out."

CHAIRMAN BOWMAN, of the Executive Committee: "Gentlemen of the Congress: The Executive Committee met this morning to receive propositions, according to our articles, and they recommend to you that Billings, Montana, be chosen by this Congress as the place for holding the Fourth Dry Farming Congress. (Applause.)

MR. LASH, Nebraska: "I move that the recommendation by the Executive Committee be concurred in by this Convention by unanimous vote."

MR. RICHARDS, Colorado: "I second that motion."

GOVERNOR BROOKS (Presiding): "It has been regularly moved and seconded that the recommendations of the Executive Committee when they selected Billings, Montana; for the next meeting place for this Congress be concurred in and made unanimous. All those in favor say 'Aye,' and those opposed 'No.' The 'Ayes' have it, and Billings, Montana, has been selected unanimously as the next meeting place of the Congress."

Montana's Welcome.

MR. GEORGE, Montana: "I wish to say a word of thanks for this honor. We have certainly appreciated the welcome given us by the governor of your state and the people of your city.

Dry Land Area.

"I wish to say that in the State of Montana we have 20,000,000 acres of land capable of cultivation under this dry farming system which will produce 500,000,000 bushels of wheat in one single year, which means $500,000,000.00. We realize that this is the greatest work of the country; that it means more to the people than any other work because it is enduring and everlasting, and I wish to extend to you a welcome to the State of Montana on behalf of the Governor of the state. The members of the Supreme Court and the legislature in our state today have extended to you a welcome, and the entire press of the state is with the movement. Mining men, cattle men, and all classes give you welcome; in fact, Billings people are universal in their welcome. Our city is located in a valley, years ago occupied by buffalo, elk and bear, and today they have left in that valley a force of energy that extends through the people, and we extend to you today with all that force and energy a welcome. When you enter that city you will find, blazing in electric lights, the word, "Welcome." Every door will stand ajar, and each home, with outstretched hands, will bid you welcome. We have there a half a dozen hotels, two of which are the best equipped in the entire West, the most modern, and we also have every lodging house and home waiting to give you welcome. Three thousand children will be in the streets to sing a welcome to you when you come to Billings. Gentlemen, we want all of you to come. We do not go on words in our city, we go on results. We have a reputation at stake that is known throughout the state of Montana for making good, and I want to state to you, on behalf of the citizens of Bllings, that we will make good, if you will only come and see us."

Stock Men Interested.

GOVERNOR BROOKS (Presiding): "We will be there. The stock industry of the West is deeply interested in this dry farming movement, and we will now have the pleasure of listening to that genial, whole-souled character of Wyoming, known in every state of the West as 'Colonel' Bell."

THE DRY FARMER AND STOCK GROWER.

Address by E. J. Bell, Ranchman, of Laramie, Wyoming.

"Our friend, Mr. Burns, only gave me notice of the talk that he wanted me to make last November, and I find there hasn't been sufficient time. However, I made every effort that I was endowed with. I wrote some three or four hundred different speeches, and it was impossible to draw upon my imagination and transfer to paper, big enough in magnitude for this occasion. I would have put in more time along this line, but I telephoned down for some more paper, and the paper man said, 'if we give you any more we will have to put in a new order, therefore, we will have to collect for what you owe us now.' That was $39.40, and I told him I was no longer in the market. Therefore, I will have to trust in God and you grand people to talk to you on this occasion. Mr. Mohler, night before last, after giving you a short talk, went over to the hall of exhibits, and I had the pleasure and privilege of being with him for a few hours afterward. He said, had he gone over and seen the exhibition placed here for your inspection, that he would have talked at least thirty or forty minutes more. He also said that he thought he ought to have made an apology for not talking longer, and he gave me in brief a few things he had done, with the assistance of Colonel Judson and our friend Cooke up in Oregon, and I am going to relate them to you, for you ought to know. He said that he took up, through Mr. Judson and Dr. Cooke, a little work in dry farming districts in Oregon, with the result that they were now bringing into the State of Oregon from agricultural produce some $60,000,000 annually, and to the railroad owned by the great magnate Hill, some $2,000,000 a year, and land had gone up in that section of the country from prices it was then worth, and now is worth something over two billion dollars. I do claim that no man can possibly draw on his imagination to express the magnitude of this meeting in this grand town of Cheyenne, with its noble people to give you the welcome it has. I feel that in giving you my impressions of the real relation of the dry farmer to the stockman, I ought to give you a little humor along with the seriousness, but after listening to the talk from that clever gentleman, Professor Campbell, it absolutely took all the humor out of me, and I feel like preaching you a sermon on this subject.

"I would like to talk just a moment before I take up the subject that appeals to me above all others and which, if you will allow me, I shall do. We have three classes in this country; we have the leaders and the wheelers, and between the leaders and the wheelers we have another faction, they are the kickers and knockers. As I understand it, the duty of the leader is to pave the way and make paths and roads and climb the hills and look into the valleys with the undeveloped resources ahead of the noble wheelers who afterwards come along pulling the load. I believe that gentlemen who spoke a while ago is one of those wheelers.

"Permit me to quote you a misfortune which befell me. We first began to farm over on the plains with the noble animal, the horse. We found it impossible to make him do the heavy plowing, and in order to lessen his burden we bought a traction engine and then we believed our troubles were at an end. Not understanding the true management of the engine, we found a little later that our troubles had just begun. But it wasn't the fault of the engine—no, sir. It was the misrepresentation of the agents, who led us to believe that it would do ten times what it would do. Just at this time a friend of mine over in Utah, Jesse Smith, told me it was economy to use old style oxen, and so we started in and bought up oxen. This country was too modern for that class of work, so it became necessary for us to do business. So we commenced and bought all the old bulls in the country and the first step in making them useful for our purpose was to yoke them to a sled and let them break themselves. One of my neighbors, a cattle man, sent word that he had a bull for sale. He put a very low price on him and I went up. He said: 'He is broke to lead, and is well trained,' but I didn't comprehend what that meant. I took him down home and yoked him up and put him in the sled, but I soon saw he had a disposition like his former owner, so I stood a little clear of him. But when I came along in the yard I saw the chain was unhooked, so I stepped up to hook the chain and when I woke up I was eighteen feet from the sled. I examined myself for my nose and face and I thought it was gone, and the next thing I discovered was two teeth missing. So I got up and went to town to see a doctor. The doctor said, 'your nose and face are all right. You don't need a doctor, you need a dentist,' so I went over to the dentist, who said: 'You are in bad shape, Mr. Bell,' I said I am aware of that. 'Just as soon as the impression of that bull's foot gets out of your mouth and I can take an impression with plaster paris, I will make you another set of teeth,' said he.

"The boys wanted to know if I wanted the critter killed. I said, I don't know what to do with him, but I will tell you what we did with him. We put him in between a leader and a wheeler. He was the most obstinate animal I ever saw, but if you people have any kickers in your part of the counry that you don't know what to do with, send them over and I will make them leaders and wheelers and send them back in the fall, C. O. D. Now I told you I had disposed of all these original speeches but my wife prepared something for me and with your permission I will read it:

Lamb Fattening.

"If my memory serves me aright, about fifteen years ago we fed our first lambs on grain. A very few were fed at this time. Lambs at this time were worth from 75 cents to $1.25 per head. Corn was considered a very high price at 25 cents per bushel, often sold as low as 15 to 18 cents per bushel.. Lamb feeding increased to such an extent that corn has sold for the last nine years at an average price per bushel of forty cents. In the last nine years lambs have sold at a price on an average of $2.65 per head. You will notice that both corn and lambs have made a gain of over one hundred per cent. These results do not, however, stop here.

Increased Values.

"Mr. Farmer, your land has also doubled or trebled in value. Mr Sheepman, your entire herds have also doubled and trebled in value

Mr. Farmer, you have added to your industry many thousands of acres more to your cultivated land, thereby making many thousands of homes.

Farmers Help Stockman.

"My brother sheepman, you have increased your number of sheep from sixteen millions to thirty-four millions. You could not have done this if it had not been for the farmer with his energy and the increased number of acres of farm land. Without the farmer you today would have no market for your lambs. Therefore, you would be compelled to reduce your herds to half, or less number; therefore making the consumers of our products suffer more than they are. The cry throughout the land now is 'meat product too high.

Stockmen Help Farmers.

"On the other hand, my dear farmer, if it had not been for this sheep industry your farm products and the price of your land would be far below what it is sold at today. Therefore, noble sheepman, you must do everything in your power to encourage every kind of farming, dry or wet. Also, every citizen in this state, no matter what his vocation may be, should encourage these industries. See the revenue that comes into your state through these great industries! See how it has increased in this period of time!

Live Stock.

"Brother sheepman, every acre of land that is cultivated in your state adds to your safety from the ravages of the storms. It also adds to the safety of increasing the number of herds. It also adds to your credit in getting money.

"It might be well to give you some of my personal experience in Albany County that would throw some light upon the relative interests of the two industries and the great advantage that the state and community gets from the farming of our land.

Live Stock Fattening.

"We have a body of land containing five thousand acres, all of this land fenced. For a number of years its carrying capacity of live stock, as we used it to its best advantage—we wintered 2,500 to 3,000 sheep annually, pastured in the summer for about ninety days, 200 cattle. This was its carrying capacity in its natural state. We plowed and put into domestic crop about 1200 acres of this 5000 acre tract, barley, alfalfa, field peas, oats, rape and different kinds of roots. We have been carrying since we put this under cultivation, from three to four hundred hogs annually, 100 horses, about the same number of cattle, and we have been wintering and fattening from 8,000 to 10,000 sheep. Or, to be more plain, on this 5,000 acre pasture, with 1200 acres cultivated, we are handling about as much live stock as weha ndled on 50,000 acres of open ground.

Hog Fattening.

Sheep.

"I might add here, that part of this 50,000 acres is in the Medicine Bow Forest Reserve, and the cost for the use of this land from my friend Mr. Pinchot, is nearly as much as the cost of farming this land I above mentioned, with ten thousand times more worry, to say nothing of the humiliation under power rule. With indulgence I will give you an illustration of the pessimistic and optimistic family.

Increasng Land Value.

"Mr. Farmer and Mr. Sheepman, we have also enjoyed other privileges that might be well to mention. This 5,000 acres in its original state had a value of $2.50 per acre Today we have a number of good families, beautiful farm houses, a good school and church, and this same land has a commercial value of $30 to $50 per acre, and it will not be long until the value will reach the $100 mark.

"We have other resuts to be proud of, and we are. On this same farm we are speaking of, the proudest day of my life, the happiest day of my life, the most worthy and the one in which I achieved the most good of any day during my stay here on earth, was the 28th day of August, 1905. We had a farmer's banquet, represented by the greatest body of men ever gotten together in the United States on an occasion of this nature, headed by our Governor, our United States Representative, the Presidents of this great Union Pacific railroad company and of the Laramie Hahn's Peak & Pacific railroad company, U. S. representatives of the Agricultural Department, United States Representatives of the State of Nevada, ex-United States Represenatives, bankers, lawyers and business men; and this class of representatives, thirty-five in number. This alone was sufficient to make it the proudest day of any man's life, but still more—the results.

Acreage Yields.

"It was my pleasure, my pride and my privilege, to conduct this grand party through a field of oats that threshed in this same year, one hundred and thirty-seven bushels to the acre, a field of peas (150 acres) that netted, after every expense being deducted, $18.88 per acre. And more and greater results—in the year 1908 there was in Albany County something like two hundred thousand acres of land sold. Of this amount

Land Values.

eighty thousand acres of it was sold in small quantities running from 40 acres to 240 acres, to six hundred different people. Or, in other words, Albany County sold something over three million dollars worth of land in the year 1908. All of this could be credited to this grand day of August 29, 1905.

"We also could with safety, credit to this day of August 29, 1905, the building of the elevator and flourishing mill at Laramie, which doubtless stands second to none between San Francisco and Omaha—modern in every sense of the word. The mill has a capacity of 125 barrels per day, and the elevator a capacity of 50,000 bushels per day. The machinery is so modern that we have unloaded a car of grain in forty minutes.

"All of this would only be fair to claim as coming from the Farmer's Banquet, if not directly—indirectly. The quality of the flour they are making we have no better evidence to offer you than the bread on exhibition over in Exhibition Hall.

"Master of human destinies am I!
Fame, love and fortune on my footsteps wait,
Cities and fields I walk; I penetrate
Deserts and seas remote, and passing by
Hovel and mart and palace, soon or late,
I knock unbidden once at every gate!
If sleeping, wake! If feasting, rise before
I turn away! It is the hour of fate.
And those who follow me reach every state
Mortals desire, and conquer every foe
Save death! But those who doubt or hesitate,
Condemned to failure, penury and woe,
Seek me in vain and uselessly implore;
I answer not, and I return no more."

SEED BREEDING AND ITS RELATION TO DRY FARMING.

(By B. C. Buffum, Agronomist, Worland, Wyoming.)

GOV. BROOKS, presiding: "It is very important that seed breeding in connection with other work should be considered in connection with dry farming and we will now have the pleasure of listening to Prof. B. C. Buffum, who had a wonderful experience along this line and is a citizen of Wyoming, whom we claim to be the Burbank of this state."

MR. BUFFUM: "Ladies and Gentlemen: I am afraid that is rubbing it in a little bit, when they call me a Burbank and I am reminded of a little couplet which I heard some years ago, which runs like this:

"There was a great Congregational preacher,
Who said to the hen, you're a creature,
And in consequence of that,
She laid an egg in his hat,
And so did the hen reward the preacher."

"I will not detain you very long for my paper is not over six or seven minutes long.

Soil Treatment.

"The factors on which the development of dry farming depends are some moisture, suitable soil, a successful system, and adapted or adaptable crops. We must have moisture and conserve it; we must have soil and till it; we must have plants and grow them, and it is worse than useless to raise unprofitable crops. Any one of these factors is as indispensible as any other, but perhaps the greatest opportunity for the advancement and success of any kind of farming comes from the science of plant breeding

Seed and Plant Breeding.

"There are known limitations to the amount of moisture that may be conserved; there is a fixed number of varieties of farm crops from which to choose at any one time, but it would be difficult to fix in mind, or estimate a limit to our power to adapt crops, or to our ability to create new and desirable farms. What has already been accomplished in plant improvement and domestication is only a slight indication of how the work before us will result. Some of our expectations of improvement will be realized quickly, others will take a long period of time.

Plant Development.

"The story of the changes which have been made in plants through domestication is like a fairy tale. From an annual weed growing on salt sea marshes came our highly developed sugar beet, simply by cultivation and selection. From another weed, one of the common mustards, has come the turnip, radish, rape, kale, kohlrabi, Brussels sprouts, cabbage, broccoli and cauliflower. This illustration is probably the most remarkable one of variation of any single form of plant life. We now have civilized barleys which are as bald as our most strenuous thinkers. We have roses without thorns, fruits without seeds and even onions without the small. What it has taken centuries to do heretofore we now do in a comparatively short number of years.

"It may be said that we have only just begun to breed plants scientifically. Enough has been done to show, not only the possibilities but some of the certainties of plant breeding. It is as positive a science as mathematics.

"We have much to do to develop suitable varieties for dry farming. We have already learned something of the value of drouth resistence and also of the necessity of securing other qualities which make plants more hardy, more persistent and more productive. That we will be able to overcome certain objectionable features in plants is positively certain.

Barley .

"For example, our beardless brewing barley and the beardless, hulless barleys, have weak straw just below the head which causes loss by the head breaking off. It will be a much more simple matter to breed strength into this straw than it was to get rid of the barley beards.

Sweet Clovers.

"Our sweet clover has flavors disliked by stock. It will be no more difficult to breed a sweet clover with the bad odor and flavor left out than it was to breed the bad smell out of the onion or change the color of the California Poppy. Already the sweet clover is the most persistent and hardy of all clovers. It is resistent to drouth, to alkali and to disease in a remarkable degree and is most able to produce growth by getting its plant food from poor soils. Ridding it of its one objectionable feature, that of being unpalatable to stock, means more to Western agriculture than can be foretold.

"Plants acquire their ability to thrive under different conditions by being made to live and produce under those conditions. I once knew a man who tried to adapt himself to the climate of Alaska by exposing himself to cold and storm at home. Of course he could not reproduce the climate of Alaska, but it did not matter, for the exposure got him before he got to Alaska.

Stock Breeding.

"An attempt was made to breed a sheep for Western ranges in the fields and barns of Iowa. It did not succeed. Horses bred in Missouri take two years or more to become acclimated in Wyoming before they can stand full work. Corn from Yucanan will not ripen at Yakima. Bananas born and bred in Bermuda do not bear in Billings.

Seed Adaptation.

"The ultimate success of dry farming depends as much on adapting crop plants to dry farm environments as it does to any other factor. The fact that dry farming has succeeded as well as it has with only such crops as have been available, is one of the greatest arguments for future greater success, when we shall have had a few years in which to adapt our own varieties to the climate and soil of the West.

Dry Land Crops.

"In our dry farm crops drouth resistance is not the only characteristic we want. There are many native plants in the arid region which live and make some growth. We want larger producing power. The ordinary thorny cactus produces an insignificant amount of growth. The great achievement of Burbank was not so much the breeding off of the thorns of the cactus as it was putting into it vegetative growing power.

Adding Growth to Plants.

"He made a thornless cactus, it is true, but he did more, for he made it grow to the amount of one hundred tons of green forage per acre in a season. His changing the color of a flower is not so important economically, nor is it so wonderful scientifically, as making a new walnut tree which will grow ten times as fast as other walnut trees grow.

Productive Necessity.

"The making of a new grain may be valuable if it presents some desirable perfection of form or quality, but it will appeal more to the practical man's pocket-book if its productiveness is improved and it gives more pounds per acre which will sell for the same price The early Cape oats will ripen in July and produce ten or fifteen bushels per acre, but we are more interested in a Russian oat that will use the whole season for its growth and yield seventy bushels per acre. This question of productiveness is one which has in it much encouragement for the future.

Seed Breeding.

"The arid region is the most fruitful country in the world and we get remarkably large crops of varieties which have not yet been adapted to the soil and climate. It is my conviction that a few years of plant breeding and improved farming will result in more than doubling the average yields of our staple farm crops. If we use a very conservative estimate of 200,000,000 acres of dry farm lands in the West, one-half of which will be farmed each year, an increase in crop value of but $1.00 per acre makes figures large enough to attract our interest and have a most important bearing on our future development."

PRACTICAL DRY FARMING.

By George L. Farrell, Ranchman at Smithfield, Utah.

"Mr. Chairman, Ladies and Gentlemen: I have just twenty minutes in which to talk and I will have to hurry over and not make any preliminary. I commenced dry farming in Utah in the year of 1866, forty-three years ago, having come from Iowa where I had been used to farming.

Causes of Failure.

"I commenced work on a dry bench just as I used to farm in Iowa. I broke my soil about three inches deep and worked it over the best I could and sowed my grain. It came up all right, first rate, and grew up about six inches high, and the sun and warm winds came along and it lopped over, wilted and died. The next year I plowed the ground again about an inch deeper, attended it the best I could and sowed my grain. It grew a little higher and died again. The third year I plowed about an inch deeper still and it acted just the same, only it grew a little taller; started to head out and then died. I lost my crop for three successive seasons, but I kept breaking more land and each year putting more in. My neighbors all told me, you are certainly plumb crazy trying to raise grain on a dry bench like that; you will never do it, I used to think sometimes I was a little daft, but perhaps I would get over it after a while and I was determined to find out for sure whether I could raise grain or not.

"The fourth year I met a friend of mine who wanted to buy some city lots I owned in Logan. He wanted to trade three fine horses, two weighing about 1,400 pounds each and one about 1,200 pounds and a good set of harness. Previous to this I had been plowing with one yoke of cattle and a ten inch plow. 'Now,' thought I, 'I will trade those lots off, get those horses and get a larger plow and see if I can't do better business.' I did so, and I started to plow a half mile long. I went about ten times around splendidly, but I had some wet grass in spots. It grew about five feet high with roots about as big as a six quart pan and all at once the point of my plow run into the center of one of those roots and the horses gave a jerk and broke the beam off close to the stem. I sat down on the steam of the plow and considered what to do, and I made up my mind to go back to Logan and have a beam put in, two inches wider and two inches deeper, one that the team couldn't break. So I went to a carpenter shop and told him just what I wanted and he said: 'I have just the timber you want, a post of tough red pine.' It was about six inches longer than the beam and he said he would put it in the whole length, that it would be better. I started back for the farm and the next morning I started to plow, and went about forty feet, when I found he had got the point of the beam a little too high and my team couldn't pull it. I was in as bad a fix as I was the day before when I broke the beam.

"I sat down and thought what to do and made up my mind I would pull the point of the beam up and raise the plow out. While thinking this over, a friend of mine rode up behind me and said: 'What is the matter, I have seen you sitting here ever since I came over the river?' I said. 'Look at that plow; it is over the mold board and I have only gone forty feet. If I should go a half a mile I would be clear down to China; what am I going to do?' He said: 'Peterson is down here herding cattle on the bottoms. He has a large team, go and hire his horses and use the four of them and get it out.' I did so and found it did just as he said it would, and I broke my land eight inches deep.

Deep Plowing.

"I continued until I broke 100 acres, eight inches deep and then I pulled a roller on it and roller it down. I had a boy on the roller rolling every afternoon and then I disked it good and then the ground was level.

Soil Treatment.

and harrowed it, and in that way I kept at it until I got it all worked up fine. While I was finishing this harrowing and disking I made a leveler fourteen feet long and went crossways so that it filled up and levelled every dead furrow. I hired a nephew of mine to run my drill. He was instructed to sow a bushel and a peck to the acre. But some way he got it a little thick and when he got it all sowed but eight acres and he only had four bushels of wheat left to seed, he wanted to get more wheat. It would take six bushels more. I said: 'There isn't another bit of the kind and I don't want to mix it. I want you to go to work and spread that four bushels on the eight acres.

Light Seeding.

"He did so and the wheat all came up very nicely and as soon as spring opened and the ground dried up, I took a harrow and tipped the teeth back and harrowed it both ways, and pulverized it. It came out nice and the heads on this eight acres were about one-third larger than those on the other part where I sowed a bushel and a peck. The straw was stronger and about a foot higher. I made up my mind I would cut that eight acres by itself and weigh it and then weigh the other and see what the advantage was in sowing grain thick or thin. I did so and the eight acres produced seven bushels more to the acre than that where I sowed a bushel and a peck. So I learned in that one season, by a mistake of the carpenter how to plow, and through not having seed enough, how thin to sow the grain. Since that time I had added another section of land and I have continued to increase my plowing. The railroad came along and the government ceded to the railroad every alternate section. I took my first quarter way across the four forties, drew an odd section, section 17 on the northeast, and section 13 on my northwest and I filed on the two sections and bought them. I had ten years in which to pay for them and I went to breaking up more land each year. I turned it just as I had before and hired men and had them sow the grain and compelled them to sew not more than 35 pounds to the acre.

No Crop Failures.

"Well, after this loss of crops, since that time I have never failed and I have been working at it 43 years and never failed to raise a good crop. One of these sections is east of the railroad and west there is about 145 acres, the balance is on the east of the railroad. I made a road down through the center of it and put a fence up through the center and consequently I summer fallow on one side while the grain

Summer Fallow.

is growing on the other side and I only sew grain every alternate year. I raise a crop on that side while I summer fallow on this side. I turn my stock on the voluntary grain and they get fat. I sewed the south half of the section, the whole of it below the raidroad, 224 acres and it came up fine, looking well. I had my son, 14 years of age, working there and I went over just as the grain was turning ripe and it stood about five feet high. I said: 'Alfred, let's go down and look at that grain.' We went down and looked at the grain and half way through the patch we walked through a dead furrow and when we got two-thirds of the way across the half section, I noticed off to the left, to the southwest, a patch of wheat that was about ten inches higher than the other and perfect grain. I said: 'What is the matter over there? Let's go and look at that.' So, we walked over and found that the squirrels had been working under that ground.

Sub-Soiling.

"Those little fellows had been sub-soiling there and the moisture had gone down. The sun was bringing it up and keeping that grain growing. The stalks of grain were higher and the heads were larger, plumper and greener. I said: "I am going to send east and get a subsoiler and sub-soil this whole half section.' I did so and sub-soiled the half section six inches deep.

Soil Treatment.

"I plowed the land eight inches and sub-soiled six inches, making the depth of the soil 14 inches. The sub-soiler of course doesn't turn it up on top.

Thin Seeding.

"I sewed grain 35 pounds to the acre on this patch the next year and it came along fine and did well.

Acreage Yields.

"We threshed 40 bushels and eight pounds per acre on the 224 acres. By this time the people began to see that I was growing grain and they began to settle up around me and take up land, until today you cannot get a foot of land in that country for love or money. For that very 224 acres two years ago I was offered $75.00 per acre. I paid $4 for it when I got it from the railroad. Now it is as I told you, 43 years since I commenced and my neighbors from all over the country come to me and ask questions about dry farming and what they shall do. I go to the agricultural college and give lectures on dry farming. I go to the Brigham Young college and do the same. I go to different parts of the country lecturing on dry farming whenever I am called on, and the people who follow my advice prosper; they never fail. Now then many questions have been asked here and my talk will explain and answer those questions.

Fall Plowing.

"About fall plowing, the question has been asked, 'Is it best to plow in the fall or the spring?' I say, plow in the fall every time. I don't care how dry the ground is, it matters not; if rough, you have to break up the lumps. It's all the better.

Soil Treatment.

"I leave the ground rough all winter and the snow and rains come and fertilize that soil and pulverize it, and as soon as the spring comes I take a disc and harrow behind the disc and lap the disc and harrow half way. We go lengthwise and as soon as that is done, turn crosswise and do the same. In a short time you will see the little weeds coming up, and when they come so you see them nicely I put the disc to work again and the harrow. I sometimes harrow and disc it four or five times in the season. We don't allow weeds to grow on the ground. We cultivate the ground and from the 25th of August until the last of September, just before we sew, we put the leveler to work and level it all over, so that you can see to an inch where the drill has run and we don't miss any of them; you cannot afford to miss, and we sew 35 pounds to the acre, and if the ground is very rich we sew a little more. But I make my tenants sign a contract in writing that they shall not sew more than

Thin Seeding.

40 pounds to the acre and if they sew over a bushel they have to pay for the loss in crops, because it will not produce half as much as that sewn thin. Because where you sew seed too thick on ground in dry farming, it will draw sustenance out of the ground and it cannot mature so as to get a crop. I will relate one circumstance to prove this to you. I used to sew rye, and a Danishman moved into the neighborhood about a mile away. He came to me and wanted to know if I had some rye to sell for feed. I said: 'Yes, sir, plenty of it.' He said: 'I want to buy 15 bushels.' 'All right, sir, you can have it.' He said, 'Will you take work

for it; I don't have any money.' I said, 'Yes, sir, I would rather have work than money.' 'I want 15 bushels.' 'How much can you sew in a day?' 'Twenty acres.' "All right, sir, you are just the man I want; I will give you three bushels or rye a day and board you for five days, and in that five days you can sew 100 acres; that will give you 15 bushels of rye.' 'All right, sir, that's good pay; I'll do it.'

"He came along and I had the rye sacked all ready to sew and he came down and said: 'You haven't got near enough rye here to sow that.' 'Yes, I have.' 'How much are you going to sow to the acre?' 'Half a bushel.' He said: 'You don't know nothing about raising rye.' I said: 'I don't pretend to know much about it, but that is all I want sewed.' 'Why,' said he, 'in Denmark we sew three bushels to the acre.' I said: 'I want you to understand we are not in Denmark now, we are in Utah. Can you sew a half bushel to the acre?' 'Yes, I can sew a peck if you want it.'

"He did it and did it well. I paid him his fifteen bushels and he went and sewed that 15 bushels on five acres. About the middle or latter end of April, I forgot the time, I was going past one day and he called to me to come to his house. I drove up and he said: 'I want you to come over and look at my rye. I went out and looked at his rye back of his house and barn, and it stood about four inches high and just as thick as it could be. I said, 'That looks nice, don't it.' He said: 'I am going to show you how to raise rye this season. I looked at yours and there was one spear up here and another within about a foot of it; you won't raise much on that.' I said, 'Perhaps I will show you how to raise rye this fall.' Sunflowers commenced coming up in mine and I hired a man at a dollar a day and board to harrow the field, both with the furrow and crossways of the field. After he got through he came over to Logan and when I gave him a check he stuck it in his pocket and said, 'All the rye you will harvest on that piece of ground you can stick in your eye.' Well!' said I, 'I don't pretend to raise sunflowers anyhow.' He said: 'No, you won't raise sunflowers or rye either.'

"This was in the beginning of April. After a while there came on some nice rains and along about the latter end of April, you could see the rye coming up.

Acreage Yields.

"It grew fine and got up as high as the top of my head and we cut it in the fall and threshed it and it made 27 bushels to the acre. It surprised the whole country and I told the threshing man when he went up to Erickson's to thresh to let me know how much that rye of his threshed. In a day or two he came along and said he threshed that five acres of rye and it just made 20 bushels, four bushels to the acre. He said the heads were only one inch long and the kernels only one-fourth as large as mine.

Thick Seeding Reduces Yield.

"Many of you have noticed when you sew grain, that every place where you take the grain out of the sack you will waste a little; maybe you have noticed that it comes up strong and thick and the heads are only one inch long. You see all the sustenance is drawn out of the soil and it cannot mature. Where it is thin, there is plenty of chance to draw sustenance out of the ground and give a plump grain.

"I thought I would tell you there things, but if you don't remember—I was asked by some of the members of the agricultural college to publish a book on dry farming and I have done so."

THE MONDELL BILL.

The Secretary read the following telegram:

"Washington, D. C., February 24.

"Please convey my best wishes to The Dry Farming Congress. I feel confident that the passage of the enlarge homestead bill will greatly stimulate and encourage dry farming development. We hope to have extensive areas in all of the states to which the bill applies designated as subject to entry under the act at an early date. I am confident your deliberations will be very helpful to the cause of home building in the West.

"F. W. MONDELL."

GREETINGS FROM NEW MEXICO.

The Secretary read the following:

"Santa Fe, N. M., February 23.

"John T. Burns, Secretary Trans-Missouri Dry Farming Congress:

"No Congress except possibly the National Irrigation Congress is doing more for the development of our arid and semi-arid west than the Trans-Missouri Dry Farming Congress. Wish I could attend this important meeting. The time is fast approaching when not only the individual farmer himself but the whole public will begin to see the value and necessity of proper handling of the soil and conservation of the moisture in our semi-arid sections. Here in New Mexico we are especially favored with the best climate in the world and are abundantly supplied with the most fertile soil, therefore we are greatly interested in dry farming. The most optimistic person cannot hope to make a success of unirrigated lands if they pursue the former methods of farming and many of the farmers now coming into our territory without proper guidance will make failures where successes should be. I shall most highly appreciate a copy of the proceedings of your meeting.

"VERNON L. SULLIVAN, Territorial Engineer."

Eighth Session, Thursday Afternoon.

The Congress was called to order at two o'clock, Governor Brooks presiding.

GOV. BROOKS: "The convention will please come to order. The report of the Resolutions Committee will be made a special order of business at four o'clock. I will invite Chairman Bowman to preside for a while this afternoon. We will follow the program closely and will endeavor to have discussions from the floor a little later.

THE RELATION OF DRY FARMING DEVELOPMENT TO COLONIZATION IN THE WEST.

By C. L. Seagraves, General Colonization Agent, Atchison, Topeka & Santa Fe Railroad Company, Chicago.

MR. SEAGRAVES: "Dry farming, or to be exact, 'scientific soil culture,' is playing a very important part in colonizing the lands in the semi-arid sections of the Southwest.

"In the early days of central, and especially western Kansas, it was hit or miss with the homeseeker, more often miss. When harvest time came with no crop to harvest, the poor settler loaded his family and his few worldly possessions on the prairie schooner that had brought him West and headed back East to his wife's folks, ready to condemn and curse a country which he did not understand.

Causes of Failure.

"In many cases, of course, he belonged to that shiftless, roaming class that overrun every new country, who are never satisfied unless on the move, men who are ready to change location on the slightest provocation and consequently always end in failure.

"There were, however, some disastrous years when the most approved methods and the most painstaking care could not produce crops. The history of western Kansas a decade ago has been paralelled in many other sections in the West. Thousands of acres of land regarded at first as almost worthless have been reclaimed at the expense of much hard work, disappointments, crop failures, bankruptcy and hardships which the weaker ones could not long endure. But the strong resourceful courageous man who stuck to his plow finally won the fight and prospered.

"These, together with those who were forced to remain and could not get away, finally pulled through and under circumstances that the present generation would not have the courage to face. These pioneers of dry farming deserve unstinted praise for demonstrating the agricultural possibilities of those sections where the rainfall is twenty inches and less. While they have not all proven successes, the percentages are sufficiently great to demonstrate the practibility of this method.

"Scientific soil culture is not a fad, simply a common sense method practically applied and is a principle in which progressive farmers are becoming more interested, even in regions of ample rainfall.

"This is true not only of the West, but likewise of the East, as we receive many inquiries from eastern farmers, who want information about dry farming as applied in the West.

Immigration Increasing.

"Dry farming has been a very important factor in settling thousands upon thousands of acres of the public domain in southwestern Kansas, Colorado and New Mexico. In New Mexico alone two and a half million acres of land has been filed on in the past fifteen months, of which from sixty to seventy-five per cent. will go to final proof.

"The wealth thus added to all this new territory runs into the millions of dollars, as every family permanently located becomes a producer and a consumer.

"The new settler seeking a home in the West or Southwest is no longer a pioneer in the sense that the settler was a decade ago. He has many advantages, usually has more capital, is far better equipped in the way of information as to climatic conditions character of soil, and crops that can be successfully grown, so that the danger of a total crop failure is minimized.

Honesty Necessary.

"In trying to interest the homeseekers in lands tributary to the Santa Fe lines, it is the purpose of the colonization department to disseminate only reliable information. We believe that every new settler should be equipped with a knowledge of the conditions where he expects to locate. We realize that under even favorable conditions he has many obstacles to meet, and so far as we are able, we steer him clear of breakers.

"A railroad occupying as important a position in the West and Southwest as the Santa Fe does, cannot afford to delude people into locating in sections where conditions are not right, merely for the extra revenue it may bring. I have repeatedly turned business away, because I knew in advance they would prove failures. Every failure in our territory is a detriment to us and the country we serve. For that reason we exercise caution in the distribution of our advertising matter and aim to inform prospective settlers as to the true conditions.

"To the man who is looking to better his condition and to make a home for himself and family in the semi-arid West, we advise careful investigation before making a move. Our one great purpose is, as far as possible, to educate that family in advance as to the country in which they are interested and its possibilities.

Value of Congress.

"Many thousand acres of good land are still awaiting the homemaker and the good work being done by this Congress, the railroads and the agricultural institutions, the scientific experiments now being conducted by men of national reputation, will mean the reclamation of much land and the making of prosperous homes for the coming generation.

Work of the Congress.

"By keeping up a steady campaign of education and experiments, the showing in the next ten years will mean a great deal to the semi-arid sections of the West. The practical object lessons will stimulate still greater activity and as a gentleman from Mountainair, N. M., wrote me recently, 'Every man in this vicinity who has applied himself has

Acreage Yields.

made good this past year, even on first sod, while many farmers on second year ground have bumper crops, 200 bushels of Irish potatoes, 50 bushels of corn, wheat averaging about 15 bushels to the acre, and five crops of vegetables, pumpkins, melons, oats, etc., those who failed having themselves to blame.

Precipitation.

"The average rainfall was about seventeen inches.

Money is Necessary.

"While application and practical brains are a good asset in the development of any new country, it is equally essential that a man be reasonably well equipped with cash, for no matter how good his intentions, he will have a hard problem to face unless he has some available capital to get through the first year."

WHAT DRY FARMING HAS DONE FOR IDAHO.

(By George A. Day, State Land Commissioner of Idaho.)

"The dry farming industry of Idaho is a new one but such a remarkable success has been made that I doubt if there is a state in the Union that has made such rapid strides and received better profits.

Dry Land Acreage.

"Five years ago the State Land Board, realizing the future value of these high lands—then considered practically worthless—made choice selections in different sections of the southeastern part of the state of over two hundred thouands acres. Its faith in these lands has not been shaken for we are still making large selecions. These lands a the present time are in great demand and if the state was not limited o acreage in the disposal of her landwe could sell them now from $10 to $25 per acre.

Land Values.

"The state this spring offered for sale in St. Anthony, Fremont county, about 4,000 acres, every acre was sold and averaged a little better than $17.

Results of Methodical Work.

"The success in dry farming depends entirely upon the cultivation of the soil. It is the height of folly to see one farmer with a bountious crop and harvest and hisneighbor across the street with the same kind and class of soil and conditions generally the same, making a complete failure, but this condition I am happy to say, is fast fading away. The bulletins issued from our agricultural colleges and our experimental farms—cultivated under scientific methods, and the work of the Dry Farming Congress, have assisted materially in educating the people in the development of this industry and has established faith and confidence in the producer.

"What has been done, can be done again under the same conditions, for like causes produce the same effects In my judgement it is anly a matter of time when the bulk of grain raised in Idaho will be taken from the foot hills and dry farm lands, for the lands under our great irrigation systems will be too valuable for the raising of grain, but will be

Dry Land Fruit.

used for fruit lands of different kinds and the cultivation of beets, potatoes, clover and alfalfa. It is now fast drifting in this direction, by so doing it is enhancing the value of our uplands. It would have meant quick development of the dry lands of Idaho had the dry farm bill that passed Congress included our state. Many people of limited wealth were ready to make filings upon land of this character under the provisions of the Act, but Idaho failed to be included and received no profit by its provisions. This caused people to ask the state to make selections, that they might lease the lands until the title is obtained fro mthe government, after which they hope to purchase the same.

Acreage Yields.

"I have not the eact date of how much grain was raised this last spring upon dry farming land but I am entirely within my boundary when I say that there was at least one million bushels and that it averaged from 15 to 50 bushels of wheat per acre.

Precipitation.

"The most successful areas where dry farm grain is raised is in an altitude from 4,000 to 6,000 feet elevation and where the precipitation is from 14 to 20 inches per annum. Again I repeat that it was thought but recently that the many thousands of fertile acres upon the rolling foothills adjacent to our wonderful rich Snake River valley were only fit for grazing purposes, but the high state of cultivation under improved mehods has now demonstrated the fact that it is the best and most profitable to the investor for he raising of grain.

Irrigation Increasing.

"People of eperience in dry farms have heard both far and near of the richness of our soil and the success attained and are coming into our territory and establishing themselves upon our dry farm lands. The dry farming industry has added thousands to our population, millions to our taxable property and has the first failure yet to be recorded.

"We welcome industrious people to our state, as thousands of acres of rich virgin soil are still vacant and awaiting to be made productive and profitable by people who are willing to do things."

OPEN DISCUSSION.

MR. HICKOK, Kansas: "It seems to me one thing that this Congress should insist upon as the most important thing of all is the spreading of this knowledge that has been gathered up and brought together. If we know everything that can be possibly known about dry farming and how to succeed in this science it will be of no value to our country unless it is put into the hands of the man who is doing the farming. He is the man who must receive this knowledge, and I think the Congress couldn't do better than to exert every effort to put this knowledge into the hands of the farmer on the farm that he might assimilate and use it."

MR. GREGG, Minnesota: " I am in hearty sympathy with the remarks made by the presiding officer yesterday, and in substance that was that we want a good deal of practical knowledge. I want to recognize here the help I have received from the men who are professors in agricultural colleges. I wouldn't say a word against them under any consideration, but I want to say here on behalf of the farmers that there have been some things said which are more or less misleading, and I infer from some things said here that after all the years we have spent along the line of semi-arid agriculture that we don't know anything. I object. We do know something. We know something about farming and we know something about success, and again we know some of the underlying laws that enter into success.

Water Conservation.

"I think I know and understand this much that when we break up this raw prairie we do it in order to get storage for water. We know another thing. We know when we do that we destroy capillary action, and when we pack it we restore capillary action, and at the same time get rid of that density. In face of these facts I am against the statement that I don't know anything, but when I get hold of a fact I hold to it. Now the next proposition is this: We know there is such a thing as surface mulch. Mulch, by the way is the way we check evaporation. I have been sorry here to see men antagonize my old friend, Prof. Campbell. I don't say he knows everything, but I think he knows some things and knows it mighty well. I worked along with him just by good will and friendship and he struck something that looked good, a number of years ago.

No Fixed Rules.

"But I think he has got sense enough to understand that he can't lay down fast rules by which this whole country from the Atlantic to the Pacific could be cultivated. It would be idiotic to say he has no more sense than that. But one of two things will maintain anywhere, capillary action and mulch to cover the top of the ground. What I want to say is, what few things we do know let's hang to it, and not say we don't know anything. Mind you, these men who are studying this matter scientifically dig up a whole lot of things that don't interest you and me at all. I found that out, but every now and then they do bring up something that is valuable. Then say you take that information and go and get some more, but don't throw away what you have got. I just add it on to what I have received before. That is all I have got to say. I could give a good many things, but when a man is past sixty years he gets to learn that what he doesn't know would make a volume and what he does know would make a very small book."

DRY LAND AGRICULTURE IN NORTHERN CHINA AND MANCHURIA.

By Prof. F. N. Meyer, Foreign Exploration Agent, U. S. Department of Agriculture, Washington, D. C.

MR. MEYER: "Mr. Chairman, Ladies and Gentlemen: It affords me great pleasure indeed to have the opportunity to tell you what the Department of Agriculture is doing in the way of introducing plants and seeds that might be valuable to this section here. It has been my duty to be out in China and Manchuria for the last three years, and I have discovered in those countries some methods of dry land agriculture that have been claimed now adays as being new, being invented by some of the people here.

Dry Farming Very Ancient.

"But I can tell you the Chinese have been practicing dry land agricultural methods for the last three thousand years. As Mr. Martin of Texas informed you, certain Indians in Mexico are practicing the so-called Campbell method and have been practicing it for the last thousand years, and it is the very same in China. So now I will tell you how China and Manchuria do these things. I will first tell you what the climate is.

Campbell System.

Climatic Conditions.

"The climate is more or less like it is here in the Dakotas. The winter is very cold and dry and little snow falls. The summers are very hot and dry and the rain doesn't start until the latter part of June, sometimes July.

Soil Treatment.

"Now what do the Chinese do? They plow their land in the fall and let it lay rough so as to conserve the little moisture that might come down. In the spring time they surface the soil. In about the latter part of April or early May you may see the Chinese farmer with a wooden plow, sometimes drawn by a couple of mules, and sometimes by an old woman or a donkey, and this plow is being dragged through the ground, not very deep, but still sufficient to turn the moist soil to the top. Then the seed is sewn and slightly covered with moist soil. After that it is rolled with a small roller. And after that the whole field is broken, that is the crust is broken.

Precipitation.

"There is one peculiar thing of which I haven't heard anyone talk, namely, this: In the very dry parts of China where the rainfall is only 15 inches, every farmer before sewing wheat, barley, sorghum, or beans,

Soaking the Seed.

soaks them in water sometimes 24 and sometimes 48 hours. I have even seen corn planted with a root two inches long. By soaking in water the seed doesn't have to draw so much moisture out of the soil around it, and by being sewed in loose soil, it is able to root at once. It slumbers there in the ground until the rain comes which is sometimes six weeks after the grain has been sowed. With regard to the exploration of different countries and the valuable materials we collect there, I might mention one thing.

Durum Wheat.

"The Durum wheat was intruduced by Mr. Carlton from the dry sections of Russia and which today is such an important crop here in the arid parts of the United States, that I am told $20,000,000.00 is the yearly income derived from Durum wheat. Prof. Buffum told us this morning of a new onion that has been discovered that has no smell. A few weeks ago I saw in a paper that a farmer in Kansas had discovered an onion that when planted between potatoes, that on the very hot days became so powerfully strong that they forced water into the eyes of the potatoes and they began to water and an abundant crop was raised. They we have one thing in China in particular. The Chinese have found out by sad experience that it doesn't pay to grow all things. The Chinese stick to only a few crops and do not experiment with new things.

Sorghum.

"Now the great grain raised in China is sorghum and I have seen fifteen different varieties. Each locality has its own variety adapted to its special needs.

Broom Corn, Millet, Beans.

"Next to those come the broom corns, and there are several varieties of those; then comes the so-called Italian millet and next to that, beans, which is the most important crop. Every year they export $1,000,000.00 worth of beans from Manchuria and China. Now to show you how well the Chinese understand that moisture in the soil is necessary, here are a few mottos: 'He that does not harrow in the autumn is a fool.' 'To eat wheat and flour, one has to sew wheat in moist soil.' 'To plow soil in the summer is much better than to plow it in the autumn.' I will now show you a large number of slides, some being exhibited for the first time to the public."

Apples.

A DELEGATE, Wyoming: "What about the apples you spoke of?"

PROF. MEYER: "They are not very well flavored, but considering that you can't grow fine apples in an arid country, we have to be thankful for what nature provides."

Peaches.

A DELEGATE: "At what altitude do the wild peaches grow?"

PROF. MEYER: "We have some of those peaches in Ames, Iowa, and in San Antonio, Texas, and they are doing well there. Nearly everything from northern China is remarkably hardy. The peaches in northern China are excellent, much better than American cling stones. All the American peaches, the best ones, have Chinese blood in them."

Crop Rotation.

A DELEGATE: "Do the Chinese practice crop rotation?"

PROF. MEYER: "They do, certainly. I have seen three rotations of sorghum, soy beans, and small grains."

A DELEGATE: "How can you procure these different grains."

Seed Distribution.

PROF. MEYER: "I sent in from Siberia about one thousand pounds of seeds and these seeds were given to different gentlemen in the Department of Agriculture and were distributed."

Prof. Meyer then delivered an illustrated lecture showing one hundred fine photographic reproductions of Chinese and Manchurian farming scenes.

THE LEGITIMATE LAND AGENT VS. THE SPECULATOR.

By J. A. Griffith, Land Commissioner, The Union Pacific Railroad.

"In the beginning, God created the Heavens and the Earth, and with especial care, that part thereof now comprising the great commonwealth of Nebraska, Kansas, Colorado, Wyoming and Utah, and with infinite wisdom and knowledge endowed it with all things necessary to human comfort.

"Then after the flight of time, a courageous Congress, during the darkest hours of the Civil War, foreseeing, but only faintly grasping the possibilities of what was to, and has, become a great empire and storehouse of wealth, wisely enacted laws that resulted in the construction of the Union Pacific Railroad, which cemented with bands of steel, and held intact, the great undeveloped West, and provided transportation for the troops and munitions of war needed for the safety and protection of the pioneers and their families then there, and for the brave men and women who were eagerly awaiting the opportunity to make their homes in the then Great American Desert.

"Then for about fifteen years, the sturdy settlers battled constantly for existence with Indians, desperadoes, and the elements, and were the victors, and demonstrated to the world the boundless resources and future of the great country west of the Missouri river.

Land Speculation.

"Then followed the era of speculation, and the legion of boomer land agents, and the equally numerous and eager army of speculators, as ready to buy as the agents were to sell to them, and bought extensive areas of the western prairies, purely for speculation, and with no intention of making or trying to have others make any practical use of the land, and without any thought for the morrow. Some of these buyers, unfortunately for the country, and those to whom they sold, disposed of a part of their speculative purchases to persons wholly unprepared to make actual use of the lands and develop them, but were left with a greater portion of the lands upon their hands, and disaster followed.

Early Failures.

"This speculation, together with the period of drouth and the plague of grasshoppers, resulted in world-wide, but in my opinion not wholly bad, advertising of the great plains, and particularly of Kansas and Nebraska. This advertising was lamentable and undesirable, and for a time brought about almost a complete cessation of the settlement and of the development of the territory involved, yet on the other hand, it placed the names of the states of Kansas and Nebraska, upon the lips of nearly every man, woman and child in the United States, and in the end has proved to be good.

Conquering the Desert.

"After this, the actual settlers, with grim determination and with an ever increasing knowledge of the proper means by which to accomplish it, worked out the problem of a livelihood and a competence, and by their efforts, made it plain that this soil, as rich as any in the world, when properly and systematically tilled, would produce abundantly, and by this, another kind of advertising, brought about a steady influx of real farmers, and laid the groundwork upon which the legitimate land agent was enabled to build up a bona fide business in making sales of these lands to actual occupants, and tillers thereof.

"In their first efforts to sell their land grants, the railroad companies were not over particular whether the lands were sold for speculation or actual occupation, nor as to the area covered by any individual sale. In fact for a long time, it was a slow and tedious process to make any sales, because of the deep rooted belief in the mind of the general public that the lands were of no value, because of the alleged lack of rainfall, and other formidable deterrent reasons.

Railroad Land Departments.

"When however it became clearly evident and well known that this prejudice was without foundation, the railroad companies were alive to future results, and as rapidly as possible strove to eliminate the element of speculation and confine the sale of their lands, as nearly as practicable to actual settlers, and exert every legitimate effort to build up the country tributary to their railroad lines, and from that time, the promoter with prospective sales of large areas for speculative purposes received little if any encouragement.

Immigration Increasing.

"This has resulted in an ever increasing army of purchasers from all parts of the United States eager to secure homes, and the demand is in excess of the supply, and in the main, these purchasers have sufficient means to provide themselves with everything necessary for the

Dry Farming Congress.

upbuilding of the country, and with the aid of The Dry Farming Congress and kindred organizations, are fast receiving and assimilating and putting to practical use the knowledge necessary to obtain from these most fertile lands, the full measure of their productiveness.

"I am not prepared to give all the praise to the sales agent who has sold only to actual settlers, nor to lay all the blame upon the speculative agent who has made sales wherever and whenever he could, irrespective of results, and in my opinion, the latter has, notwithstanding the fact that generally his work was injurious, brought about much good.

"No member of this Dry Farming Congress here assembled can measure or even remotely approximate its good results, and I am heartily and enthusiastically in sympathy with every effort it has put forth, and in favor of increasing its scope of good work at all times, and under all circumstances."

MR. BOWMAN (presiding): "Is there any delegate in the house who has anything to offer in a practical way?"

DRY FARMING ON THE COLORADO DIVIDE.

By W. S. Pershing, Limon, Colorado.

"There is no question that I have answered more often during the past two or three years, to the would be homeseeker than, 'Do you use

Campbell System.

the Campbell system in your vicinity,' and when I reply that not one out of a hundred is using it, or using it right, it calls for an explanation right away. If it is a good thing, why is it not used more extensively, and I think a few words of explanation from an old pathfinder, stockman, homesteader, and dry farmer that has been in the West over forty years, should interest many in this audience.

Causes of Failure.

"First, a very large per cent. of the people in Lincoln county and in fact all of the semi-arid districts are new people who have been renters in the east or day laborers who have come west to better their conditions. They have very little surplus money, and they figure on getting some returns from their money as quickly as possible.

"They break a few acres, and must put it to sod crop that year in order to secure the next winter's feed, and said crops keep them from summer tilling.

"The next year their funds are nearly exhausted, and they must figure for the present year again, and could not possibly think of doing work for the year ahead. Others look on it as an experiment; I remember 41 years ago in eastern Nebraska, while on my father's homestead, my father suggested that he believed that apples could be grown in Nebraska, and it would be a good thing to plant a small orchard for an experiment, and I remarked that that was looking too far ahead, that before the trees were bearing, he would be dead, and I would be gone back east.

Dry Land Fruit.

"However, we did set out an orchard afterwards, and saw it bear fruit. I set out an orchard in Lincoln county, Colorado, for a Denver man and afterwards purchased the same land and ate apples from said orchard for several years.

Cambell System.

"One of the causes of the slow development of the Campbell system is that it causes homesteaders to prepare the land a year ahead, and the larger per cent of them think they have all that they can attend to, to take care of the present year

"Another class of farmers that have seen the good effects on crops put in under scientific system, say that it is all right, and that they will put in quite an acreage next year in said manner, but are like the man who knows if he gets up early in the morning, he will get in a good day's work, and even on account of his good resolves sets his alarm clock, and when he hears it rattle the next morning, tells it to go to thunder and rolls over for another nap, saying; I will get up early tomorrow morning.

"The speaker has had good results from following the Campbell system, but is in fault for selling off his old land, and buying new land, and like my brother farmers, hard up and tempted to put in sod crops, so as to obtain some crops to help pay for the land.

Alfalfa.

"Alfalfa is going to be the king of crops for most of the semi-arid countries and will be a money maker for both forage crops and for seed. When put in scientifically will soon enhance the value of our $10 per acre land, to $50 and $100 per acre, and will pay good interest on same at the latter price. The demand is getting greater and the prices higher on alfalfa, and alfalfa seed each year.

Soil Treatment.

"Having recently purchased several thousand acres of land close to Limon, I have teams at work now disking the land that is already broken, and will keep packing, disking and harrowing, on 300 acres of same until the month of May, and then sow it to alfalfa; I will also make a good seed bed on a couple of hundred more acres for spring wheat, barley and oats.

Canadian Field Peas.

"I have this month sowed about twelve acres of field peas, and will sow about the same number of acres in March, and also in April, and perhaps later. I have grown field peas three or four years, but am still experimenting as to the best time to sow and as to the best soil adapted to the field peas. So far I have better success on the heavy soil, than I have had in the sand land with peas.

Soil Treatment.

"In the early spring, I will have several hundred acres broken and packed and later on will have some summer tilled and packed again; later it will be disked or harrowed and then put to fall wheat or fall rye, so expect something better than the average, and will have a disc going immediately after the harvester, and the stubble ground will be double disked, so as to conserve the moisture, until the ground can be plowed or put to other crops.

Campbell System.

"Although there is less than one per cent of the people now using the Campbell system I am sure that the system is O. K., but it is not time to praise the system too high; Prof. Campbell is still with us. After he has been dead twenty-five or fifty years, the next generation will want to build monuments, and laud the man who made two blades grow where one grew before; helped to make the barren plains blossom like the rose, assisted in increasing the yield of grain, and added to the agricultural products of the world, which has become the largest and most important industry in the world.

"Fellow citizens, I have been down to the bottom in poverty, have raised a large family. These horny hands have done every kind of physical work to keep the wolf from the door. In my younger days, while I was considered a No. 1 farm hand, and always took the lead in any kind of work, I looked upon farm work as a sort of slavery and almost disgrace, and had a great yearning for city life.

"When I grew older, I got a taste of city life, with a large family to keep on what I thought was a good salary. I soon got enough of it, and there is nothing that gives me so much enjoyment as to be in the field with my coat off, breathing God's pure air first handed, and assisting nature to produce vegetation. I was showing the blister scars on my hands to Prof. Campbell and another gentleman and they inquired of me if my boys had blisters on their hands. I said, no, my boys and hired hands wear gloves and work scientifically, where it is hard work for the old man to get out of the ruts of doing hard labor.

Dry Farming Congress.

"Now one thing more, brother delegates, we must learn to pray—and it must not be, 'Now I lay me down to sleep,' but 'Good Lord, give us one million people who will put up $10 each to become life members of this Congress.'

"I am thankful that I have lived to see the day when our best people from the president of the United States down to the school boy are getting interested in agriculture, and making a study of scientific soil culture; and the city boy and man getting a yearning for a little land and live stock of his own. The boy on the farm is getting to realize that he has an occupation to be proud of, and that he is connected with the greatest industry in the world, and has more reasons to be proud than the city people, who are depending on him for bread and meat and other luxuries from the farm, and I hope that larger appropriations will be made by congress for more experimental farms for the semi-arid districts, that the scientific soil culture may be seen, practiced, and appreciated by more people.

"And now I wish to tender my sincere thanks to this audience for having so patiently listened to a common farmer, and his rude way of expressing himself regarding a few facts concerning the welfare of the farmer and the country at large, while there are so many eloquent speakers from abroad for you to listen to. I thank you."

MR. BOWMAN (presiding): "If you want practical results, I have got the real thing here. I am going to introduce to you a young lady who has taken up a homestead in Colorado and made a success of it, Marguerite Frink of Colorado."

"DRY FARMING" A HOMESTEAD."

By Marguerite R. Frink, of Colorado Agricultural College.

"Doubtless you are surprised to have a girl address you on dry farming, but I assure you that the surprise is mutual as I did not know of this honor until Wednesday morning.

"I could talk a day on dry farming, but I don't want you to be like the man of whom I heard recently. This man had a nagging wife—a rare case. He came home late one evening—a rare quality of the species known as husbands. His wife thought it her duty to tell him a few things. She talked and talked. They retired. She talked on, he wakened up and still she talked. He turned to her and said sleepily: 'Darling, are you talking again or yet?'

"I suppose that I am rather an unnatural girl, but farming has always been extremely interesting to me. My first experience as a farmer was raising cabbages that I might attend the university; later I was my father's field boss as he runs a canning factory. Although I was given full sway, I yearned for some land of my own.

"A year ago last fall my sister and I filed on two adjoining quarters as desert claims. The first part of April I heard that my claim was to be contested as not being desert land, as hay had been cut on it. You may talk about the excitement of land rushes—I had a land rush of my own. A neighbor brought me word that two parties were going to file their contests the next day. In order to be sure of getting there first, I took a four o'clock morning train into Denver. But I was there ahead, right in the doorway of the office when it opened, and changed my entry to a homestead filing: It has been a pleasure to me ever since, and a bottomless pit for the study of human nature. I will first tell you what I have done with it and what I expect to do this spring.

"My sister and I decided to build a double house on the dividing line so my brother and I took a surveyor out to run the lines: We found the section stone and run our line north and south and located the center of the section, but did not run our line east and west which separated us from our neighbor on the south, because the surveyor came down with the measles. We were out two days. We stayed with my neighbor, an old man whom everyone calls Uncle Charlie. Owing to the dry weather everything was looking unpromising, even for the farmers whose land was under the ditches. That night after supper while we were sitting around the table, to make conversation I asked Uncle Charlie if he thought it was going to rain, as it seemed rather cloudy. He took out his Piper Heidsig, dented his thumb nail into his tobacco several times, and replied: 'Wal, Daisy, I believe it is, you know my terbaccer always gets soft just before a shower.' It did not rain. I have never made inquiries as to whether this is a reliable barometer or not.

Soil Preparation.

"The ground was too dry to plough, so I did nothing more material than to dream of the big crops the first month. Near the first of May, while I was in Ft. Collins, as I am a 'skule-ma'arm' also, a heavy snow fell. I decided then to farm. I hurried to my home at Lupton and put seven three-horse plows to work. Everybody thought that my sister and I were crazy on the subject of dry farming. All our friends tried to discourage us, by assuring us that we would get so deeply in debt that nothing could save us. Of course you never knew of a school teacher that saved money. So we borrowed. My father had always been strongly against dry farming, and did not offer us much encouragement.

"The first day was exciting. I drove over in a wagon with a man whom I had hired to put in a well, for we decided that it way economy to get that well in at once, as it was necessary for the men to draw water several miles for the horses. When I got there scarcely half an hour ahead of the plowers, I suddenly realized that I did not know where the east and west line was.

Home Made Surveying Instruments.

"After considering my available surveying instruments, I measured the circumference of the hind wheel of my buggy, figured out the number of revolutions in a half mile and proceeded to do my own surveying. The section was fenced on the east. As I knew the location of the stone at the southeast corner, I drove from this point due north (along the fence) a half mile and drove my stake, which consisted of ten feet of inch pipe borrowed from the well man. On top of the 'stake' I hung the man's coat. On looking around I found the government quarter stone within a foot of my stake. I put another ten feet of pipe in the center of the section where the surveyor had placed a peg. This stake was topped with a vest. Between the two I placed a third pipe with my umbrella in the top to emphasize its position. I then proceeded to place another peg, in line with these three, a half mile west. The well man's jumper came into service. It was a good thing that I ran out of pipe. Our fence was run according to this survey and later measurements by the surveyor proved it approximately correct.

Deep Plowing.

"The plowing according to agreement was to be eight inches deep at a cost of $2.00 per acre, but I agreed to give $2.25 with the understanding that none of it must be less than eight inches, and that it must be all turned, not cut and covered; and I saw to it that it was eight inches. I was right there every day, although this was before the house was built. I had a mark on my gauntlet glove that showed eight inches. If the furrow wasn't eight inches I called their attention to the fact. You know the old saying—' He who by the plow would thrive, must either hold or drive. Plow deep while sluggards sleep and you will have corn to sell and keep.'

"I tell you it looked good to see those long furrows of rich, moist earth—almost a mile in length. We reaped a bounteous harvest of rattlers during the plowing. I kept my sister busy putting up lunches and I went over every day. We started our house immediately. Of course we had all sorts of men working for us, among whom were several easterners. One fellow according to our instructions, kept a common rope around his bed several nights 'to keep off rattlers,' before he caught on to the joke. Several bit on the old gag of snipe hunting. This was before the house was up for the men to sleep in. The first victim was the best. One dark night the men took him out about two miles from the house, told him to light his lantern, step off so many paces (which he carefully did), and wait with his gun. According to their account of it nobody moved when he came in at three a. m., with his gun still loaded. It seems that he got lost and his wanderings did not improve his temper. It is needless to say that each victim meant a new lantern.

Putting Down the Well.

"The ploughing went along finely, but the well did not. Uncle Charley located a good spot for a well with his 'water witch.' He very obligingly located it on the line, assuring me of water at forty feet After sixty feet the first digger gave up in despair, and we hired a man to put a well in with an engine at $1.15 per foot. That well isn't a very pleasant remembrance. We went down 285 feet for water, and then neither man not beast would drink it on compulsion. I have had all I want of 'water witches.' We decided to dig a well sensibly and, luck or sense, gave us a well this time at eight feet, but almost half a mile from the house, located where two draws came together.

Soil Treatment—Seeding.

"After ploughing, we harrowed before planting. Most of our seed was Swadley, although we put in some White Australian and some Yellow Den. We put in 270 acres of corn, rows three feet and four inches apart, stalks about a foot apart; ten acres of hubbard squash and ten acres of ice cream water melons. Taking everything into consideration, I think that the Yellow Dent is the best yielder. We have to get a pick axe to harvest the White Australian. Before putting the seed in we mixed it with coal tar.

Protection from Prairie Dogs.

"In a box we put about 60 pounds of corn, mixed it thoroughly with a cup of coal tar in a quart of hot water. Of course, the tar and water did not mix, but the hot water softened and warmed the tar so that it spread better. The mixture must be stirred thoroughly with a shovel. If a small quantity of sand is mixed with it the seed can be used in the seeder without inconvenience.

"This will prevent gophers and prairie dogs from bothering the seed. After it was planted, we used poisoned wheat to good advantage. I suggested this to a neighbor who was losing his crop by these dry land pests. He replied, 'Well, they must have something to eat, and it seems as if there is always something to bother whatever I do.' I was not so thoughtful of the gopher. I got my corn, but the dogs got his. We planted about seven pounds to the acre. We harrowed it three times after planting, the first time crosswise, first turning the teeth backward. The last time we harrowed the corn was up four or five inches and the men complained that the harrow was tearing out the corn. We told them to look forward, not backward, and they would get along all right. We cultivated three times, the last time the corn was up so high that we had to put nose bags on the horses.

Causes of Failure.

"Uncle Charlie advised me to plow only four inches and not cultivate too much or I would lose moisture. About two years ago, before I was interested in dry farming, a friend of my father's came from the East to buy a dry farm. Father took him over to see Uncle Charlie, who wished to sell his place. The old gentleman showed him some very good corn, saying that his crop the previous fall yielded thirty bushels to the acre. My father asked him how much corn he raised in all. He replied, 'Oh, I had nearly ninety bushels.' On being asked how many acres he had to corn, he answered, 'Oh, about fifteen acres.' His wheat was fine. He had a large patch, at least two rods by five rods—an old garden plot that had been ploughed many times. He always ended his discussion by saying, 'I could have raised a lot more if I were younger.' He has lived there twenty years, and hasn't raised any more yet.

Effect of Hail.

"We were hailed out twice; the leaves were cut in shreds; we could not tell which way the rows of squash and melon field ran. Things looked blue, but we cultivated immediately. We must give our dry farm at least as fair treatment as irrigated land.

Soil Treatment.

After irrigation we cultivate, so with dry farming; after a shower, cultivate immediately.

"The squash and melons were set back by the hail to such an extent that they did not mature in time to market to good advantage. The squash went about eight tons to the acre. We had wagon loads of melons. We gave a neighbor two loads of melons and squashes. The next day he came back accompanied by a friend who wanted a load of free melons. Our hired man told the old gentleman that he did not believe that Miss Frink knew his friend. 'Well, said the old man angrily, 'I think you might give him a load anyway. He is my neighbor.' This reminds me of a story that my father tells of an actual occurrence in New York state. Ben Merchant, a wealthy bachelor, married a woman with many relatives, who visited her one after another. They built a beautiful home in town, but had no barn. One man and his wife came to visit, put their horse in the livery barn, and stayed two weeks. Merchant gave the livery man instructions to charge the grain to the visitor. He was very indignant when the man refused to let his horse go until he had paid his bill. He angrily sought Merchant and said: 'What do you mean by telling the livery man to charge the grain to me? Isn't my wife your wife's cousin?' 'Yes,' replied Merchant, 'but your horse isn't a darn bit of relation.'

Acreage yields.

"The corn averaged about twenty-eight bushels to the acre. I might put my yield higher, but I am not like the preacher of whom dry farmers remind me. A certain preacher was sometimes in the habit of exaggerating—of course, he was an exception. One of his deacons took it very much to heart and volunteered to help break the habit. 'Now,' says he, 'I will sit on the front seat, and when I think that your story sounds unreasonable, I'll wink at you and you can change it quickly, and the people will think it was just a slip of the tongue.' The next time the preacher, in the course of his sermon, told of 'a fox with a tail forty feet long.' The deacon nearly bobbed his head off winking. The preacher hesitated and repeated, 'a fox with a tail twenty-five feet long.' The deacon winked again. The preacher hated to have a good story spoiled, but started again. 'A fox with a tail fifteen feet long.' The deacon winked again. 'You can wink until doomsday,' said the preacher, 'but I won't take another foot off that fox's tail.' So with me, I won't take off my stated yield.

Live Stock Fattening.

"We fattened two hundred hogs, sold corn, a part of which went to men with land under the ditch, and we fed some cattle. We have twenty head of cattle there now in the stalks, and also some hogs. Uncle Charlie wanted to pick up the scatterings which were worth at least $300. He became quite indignant when we refused. He said that he was hailed out. My father reminded him that the same hail struck us, to which he replied: "You are always lucky.'

Causes of Failure.

"From my first observation, with due apologies to the dry farmers present, the average dry farmer is not of much force. His 'wishbone is where his backbone ought to be.' We can put most of them under the class of "in God we trust' farmers. They do not give the seed a fair show, and yet expect a harvest. They are, many of them, lazy, and, as we say, have become 'saged.' Men whom we have had working for us in the canning factory and considered good men, when they took up homesteads did not make good; they became discouraged and did not make use of what sense they had. They would not cultivate, but seemed to expect nature to raise the crop.

Subsoil Packs.

"When our crop was up but a few inches, we dug down and found that the roots had gone down as far as we had ploughed. If I were to do it again, I would sub-soil the ground and thus increase my yield five to ten bushels per acre.

"Now, as to my intentions for next year, I forgot to mention that my sister broke up the bargain of a double house. She was married about four months ago and I built another house while she keeps the double house and is living there now.

Light Seeding.

"We have in 290 acres of winter wheat—Turkey Red—seeded about sixty pounds to the acre. We put it in before our corn was cut with a path seeder. It was all up by the middle of October.

Dry Land Vegetables.

"I expect to put in some tomatoes, perhaps three acres, and beets, potatoes, cantaloupes and cucumbers. I am especially interested in tomato growing, as we are in the finest garden district in the state. Although the tomato, a native of South America, is not a desert plant, it suffers more requently, particularly when young, from an over supply than from want of water. Large yields have been and can be obtained from soils of varying composition, but a good crop can not be produced on any soil, no matter what its composition, which is not put in and kept in good condition of tilth.

Sand Loam Preferred.

"But for a choice of land, the preferable soil, I think, is a rich, sandy loam surface, overlying a clay sub-soil. By experiment, we find that clay land will give a luxurient growth, but it will not ripen, so a sandy loam, or even a distinctly sandy soil, is to be preferred, as it will be warmer and the fruit will be matured much earlier than on a heavier soil. The sand becomes warm during the day and holds the heat over night.

Deep Plowing.

"On my dry farm I have ideal conditions. I shall plow as deep as possible—eight or ten inches—follow the furrow with a sub-soil and stir the soil, but not turn it out.

Water Conservation.

"The only difference between the man farming under the ditch and the dry farmer is that the former stores the water in reservoirs and the latter in the ground. Suppose we do not subsoil plow; the moisture falls in the winter and runs down to clay sub-soil and runs off as rain runs off a roof, to come out miles away, perhaps, as seepage into a river, to help some irrigating farmer. Keep that water at home. It is yours. You might as reasonably expect to store water in a reservoir without ditches as to store it in ground that has not been properly prepared. Sand will not hold moisture as well as clay.

Soil Treatment.

"Stir your clay. When the rain falls you have a place to store it. The sand on top keeps it from evaportaing, for ground moisture is like a tea kettle—it never steams down. After a rain, cultivate so as to close the pores through which the rain passed into the ground, in order that it may not escape. In this way we can, in the average season, store sufficient moisture for almost any crop.

Dry Farming Safe.

"The dry farmer who is a farmer, will make good four years out of five, but he must work, and not loaf. He cannot sit down and drag out an existance and expect the seed to grow, mature and harvest itself. He must get up in the morning and work systematically all day and every day.

Causes of Failure.

"By observation, I find that nine out of every ten failures are due to the dry farmers, and not to the farms. Let me cite you a few instances that have come under my personal observation. Among my neighbors is an old man who, when he gets angry, or, as we say, gets 'saged,' takes a shot at his dog. As a result the dog is blind in one eye, minus one leg and lame in the others. I have seen the dog myself, and the old man admits the facts.

"I offered fodder for sale at $6 per ton. An old farmer came over and asked if this meant the corn on the stalk. When my father told him, 'no,' he replied: 'Well, I'll be darned if I will buy it, then.' The humane officers are after him now for not giving his cattle proper treatment. He has only eight or ten head and owns a full section of land, half of which borders on our south line. A year ago he offered this land for five dollars an acre, and has now refused fifteen for it, and our crops have been the cause af the raise. My father is negotiating for a half section to dry farm on next year. This I consider my greatest victory, as he was decidedly against it last year. Another neighbor rented twenty acres to a dry farmer, which was put into corn. The renter did not do anything with the crop after it came up. My father asked the owner why he did not see to it. He replied, 'Why, I have rented it out on shares; I'm not going to do the work, too.' His only occupation at the time of speaking was sitting in a rocking chair. His wife was over in Boulder working while he held down the claim and took care of the chickens. There are no screens or floor in his cabin. We asked him once last summer if the flies did not bother him. He replied, 'Wal, not very much. I don't cook much, and then I open the doors and windows and the wind blows the flies away.' The last I saw him last fall, he had sold his chickens so the coyotes would not get them and had gone to visit his wife. I do not predict a very brilliant future for him as a dry farmer. He might succeed as a politician, as he showed good executive ability in arranging matters so that his wife should support him.

"Of course, you are further advanced along dry farming lines than we are in our section, and, assuredly, no one present is lazy.

"There seems to be something about the dry farm that takes us back to primeval days. We want to take our gun and go hunting or ride out over the plains.

Experimenting Brings Results.

"Do not be afraid to experiment. The savage, by experiment, found how to strike fire. Experimenting and its results made the names of

Newton and Edison famous forever. Maybe someone else would have given us the telephone in due time, but why should we not have the advantage of dry farming experiments now rather than to wait for the next generation. Perhaps by that time we will not need it, we are making such gigantic strides in irrigation engineering. While you are experimenting do not forget to use good common sense. Read about the experiments of others. Think them over. Profit by their successes and failures. It is no disgrace to make a mistake once, but only a fool will make the same mistake twice. Do not grow discouraged. There is some path that leads out of the woods, or at least some line of least resistance where the brush will allow a path to be blazed. Above all, do not get into a rut.

"I do not pretend to know much about farming, but I am going to learn. I had better stop now for fear I may affect you as did a preacher of whom I heard. He was a dry, long-winded talker. He talked an hour on the major prophets and his audience hoped that he was through, but instead he took up the minor prophets. Many of his audience in the meantime dozed off. He shouted out, 'Now, that we are through with the major prophets and the minor prophets, where shall we place Jeremiah?' A man on the front seat awakened with a start and sleepily replied: 'Jeremiah can have my place; I am going home.'"

RESOLUTIONS ADOPTED.

PROF. CHILCOTT: "The Committee on Resolutions begs to report as follows:

DRY FARMING CONGRESS—NEW TITLE.

"Whereas, The Trans-Missouri Dry Farming Congress in its two years of existence has assumed proportions beyond the original plans of the organizers of this Congress; and,

"Whereas, Many foreign nations are now represented in the active membership of the Congress, receiving bulletins and sending representatives to this, the Third Trans-Missouri Dry Farming Congress:

"Be it Hereby Resolved, That the name of this Congress be changed from the Trans-Missouri Dry Farming Congress to 'The Dry Farming Congress.'

"Be it Further Resolved, That 'The Dry Farming Congress' maintain, as soon as practicable, a permanent headquarters and offices in some well located city of the middle West, and that as soon as practical and possible so to do, the organization be so financed and so re-organized and maintained in the various arid countries of the world, with a system of correspondence and publications in the necessary number of languages in order that all the world together may study the problems now before this Congress."

PROF. CHILCOTT: The Resolutions Committee adopted this resolution as amended, with the suggestion, however, that it might be referred to the Executive Committee before putting it to a vote of the body. This reference, of course, being optional with the presiding officer."

MR. BOWMAN: "In order to save time, I will say that the Executive Committee favors the adoption of the resolution as read."

PROF. CHILCOTT: "I therefore move that the resolution be adopted as read."

A DELEGATE FROM NEBRASKA: "I rather favor the name suggested yesterday instead of 'Dry Farming.'"

The motion of Prof. Chilcott was regularly seconded, and, on ballot, the motion prevailed to adopt the resolution.

GOOD ROADS LEGISLATION.

"Whereas, it is the sense of this Congress that one of the most important adjuncts to the success of the dry farming movement in the arid and semi-arid states is good roads; and,

"Whereas, Good roads are of immediate and practical benefit to the settlers in these states, enabling them to reach the primary markets with their products, now, therefore, be it

"Resolved, That the Congress calls the attention of the Senators and Representatives, and of the Legislatures and Governors of the states here represented, to the importance of this subject, and urges the necessity of such uniform practical legislation as will result in permanent good roads; and be it further

"Resolved, That this Congress believes the increased value of the government lands would justify a scale of increase in the price per acre of said lands, the increase to be used as national aid in building good roads."

PROF. CHILCOTT: "I move the adoption of this resolution."

A DELEGATE: "I second the motion."

GOVERNOR BROOKS (Presiding). "You have heard the motion; are there any remarks?"

A DELEGATE: "I object to that part which provides that homestead lands should receive extra charge. I think the extra charge should fall on all alike."

MR. McKANE: "I am a member of the Resolutions Committee also, and I brought in a minority report on that resolution, but I felt, and a number of the committee felt that we could let the organization decide whether or not that resolution had better be adopted or not. It is tainted just a little bit with what we call paternalism. There have been a few attempts made at different times to construct and maintain state roads and national roads, and I don't remember of one in the history of the United States where it has proven an absolute success. I am one of the men that believe that the greatest part of the propaganda for better roads comes from the automobilists. I am a horseman, have handled horses for years, and we come in competition with the automobiles, and I believe it is better to let the towns take care of their own roads and educate men for better systems of roads in the United States."

GOVERNOR BROOKS (Presiding). "The motion before the Congress is to adopt the resolution as read; are there any amendments?"

A DELEGATE: "I move that that part of the resolution referring to advancing the price of government land be stricken out, and the motion passed as amended. I was a good deal surprised that—a Congress of this kind, whose purpose is to make the path of the homesteader easy, that a resolution of this kind should be proposed. Most homesteaders have a hard row to hoe, and I think if anything should be done to the price of government land, the price should be taken off altogether, and the homesteads made entirely free."

A DELEGATE: "I second the motion."

GOVERNOR BROOKS (Presiding): "The question now is on the motion to strike off that portion of the resolution which proposes adding to the cost of land for the construction of these roads. All in favor of the amendment as made, will say 'Aye.' Those opposed, 'No.' The ayes have it. The question now before the house is the adoption of the resolution as read without that portion. All in favor of the adoption of the resolution as amended will say 'Aye.' Contrary 'No.' The ayes have it and the resolution as amended is adopted."

LAND SURVEY AND RECORD.

"Whereas, in practically every state of the so-called arid and semi-arid west, there are still large tracts of arable government lands, suitable for actual settlers, that is more or less unavailable, because not surveyed and in many sections where surveyed, the plats are not of record at the local United States Land Offices, therefore, be it

"Resolved, That this Congress urges upon the proper authorities of the United States Land Office to do all in their power to insure prompt action in having these lands surveyed, and the plats and necessary documents placed of record, that all government land in these states may be made available for entry."

Adopted by unanimous vote.

GOVERNMENT CO-OPERATION

"RESOLVED: That all members of the National Congress elected from western states be urged to give careful attention to, and urge the passage of, any legislation already proposed or which may be proposed, encouraging in any way the more general development of the arid districts of the West through the application of scientific methods of farming where irrigation is not possible.

"RESOLVED further: That all representatives of western states in the National Congress of the United States be urged to encourage a closer practical co-operation between the Department of the Interior and the Agricultural Department in its various branches, and the actual farmer in the arid districts of the West, and that these representatives be urged to secure larger appropriations for the establishment and maintenance of experimental farms for the purpose of assisting the so-called dry farmers of the West in working with the problems now confronting them, and in finally establishing so-called dry farming, or un-irrigated farming, in the arid districts, as an exact science which may be understood and followed by all agriculturists throughout the world."

Adopted by unanimous vote.

NEW MEXICO AND ARIZONA.

"WHEREAS, the territories of New Mexico and Arizona have been for many years seeking admission as states of the Union, and

"WHEREAS, They are justly entitled to such admission by reason of population, natural resources, wealth and education, and

"WHEREAS, A bill has been introduced at the present session of Congress granting such admission, which bill has been already passed by the Honorable House of Representatives, and is now before the Honorable Senate, awaiting motion; now therefore,

"Be it Resolved, by the Trans-Missouri Dry Farming Congress, assembled in third annual session at Cheyenne, Wyoming, that it is the sense of this body, that the admission of these two territories has been already too long delayed, and that great injustice is being done them by keeping them under their present form of government, and

"Be it Further Resolved, that this congress does hereby petition the Senate of the United States to pass at its present session, the bill now before it, granting these territories admission to the sisterhood of states, and,

"Be it Further Resolved, That the Secretary of this Congress be instructed to transmit a copy of this resolution to the President of the United States, the President of the Senate, and the Chairman of the Committee on Territories of the Senate."

Adopted by unanimous vote.

GOVERNMENT CO-OPERATION.

"RESOLVED: That the Third Trans-Missouri Dry Farming Congress requests that the Department of Agriculture of the United States, the Agricultural Colleges and all Directors and Superintendents of Experimental Stations in the arid districts of the West, co-operate with the Executive Officers of this Congress in the assembling of data, maps and statistical information by which the exact conditions, under which dry farming may be successfully operated in any and all districts in the arid countries, may be positively known and published for the benefit of the members of this Congress."

Adopted by unanimous vote.

PUBLISHING DATA.

"RESOLVED: That it is the sense of the Third Trans-Missouri Dry Farming Congress that in the publications of official bulletins or other publications of this Congress, no special system of so-called dry farming, or scientific methods shall be advocated, but that the Congress shall aim to give as much definite information about each and all systems, or the work of any and all experimentors as may be possible to assemble from time to time.

Adopted by unanimous vote.

FOREIGN INFORMATION.

"RESOLVED: That the Department of State of the United States Government be requested to co-operate with the Executive officers of the Trans-Missouri Dry Farming Congress in assembling information about arid farming conditions and operations in foreign countries, and that a system of official reports from the arid districts of the world be arranged between the officers of the Congress and the Department of State, by which the arid farmers of America may understand the conditions under which dry farming operations succeed or fail in the various sections of the world."

PROF. CHILCOTT: "I would say briefly in connection with this, that our Secretary, Mr. Burns, wrote the Secretary of State asking him to provide some of this information. That letter was referred to my office with the information that the Secretary of State would be glad to take up this work, but that there was not time to get the information for this Congress. So I think there is no doubt about this being received well by the Department of State. I move the adoption of this resolution."

"Motion duly seconded and carried.

FIELD COMMISSIONER.

"RESOLVED: That the Executive Committee of this Congress be urged, provided it is possible to finance the Congress to this extent, to employ, under the direction of the general secretary of the Congress, a Field Commissioner, whose duty it shall be to visit the various arid states of the West, study conditions, report the same to the Congress, address farmers' meetings, institutes, etc., and do whatever other work of a similar nature may be deemed advisable by the Secretary of the Congress."

Adopted by unanimous vote.

RECOGNITION FOR MONDELL.

"RESOLVED: That the splendid service in behalf of the West by Honorable Frank W. Mondell, Congressman at large from Wyoming, in securing the passage of the 320 acre Dry Farming Homestead Law, be recognized by this Congress by the passage of this resolution, and the forwarding to Mr. Mondell by the Secretary of this Congress a telegram expressing our appreciation of his work."

DIVERTING FLOOD WATERS.

WHEREAS, The floods in the Arkansas River have done untold damage to the property in eastern Colorado and western Kansas, and,

"WHEREAS, The diversion of such flood waters onto the uplands would be of great benefit to the people now engaged in dry farming in the section mentioned, now therefore,

"BE IT RESOLVED, By the Third Dry Farming Congress assembled in Cheyenne, Wyoming, that the proper authorities of the general government be requested to examine into the feasibility of diverting the flood waters of the Arkansas River to relieve the disastrous conditions now attending any severe high water, in that stream."

Adopted by unanimous vote

CONDEMNING FAKE ADVERTISING.

"WHEREAS, The cause of dry farming has been injured in the past, by the misrepresentations of unscrupulous land dealers who have given wide circulation to misleading advertisements concerning the matter of dry farming, and,

"WHEREAS, every untruth so presented is calculated to and does injure every legitimate land dealer and also operates to place dry farming districts in disrepute with the home-seeking public at large, therefore,

"BE IT RESOLVED, By this Congress, that any and all such misleading advertisements be condemned."

PROF. CHILCOTT: "I move the adoption of this resolution."

JAS. R. NOLAN, of Denver: "I wish to say a word on that resolution. I represent directly, the Denver Post. Generally I represent the newspaper men who are here reporting this Congress. The curse of the West has been the mining promoters in the past, and the curse of dry farming is the dry farming promoters of today. I mean by that the men who advertise things that are impossible. Now the correspondents here, newspaper men, railroad men and other men, who are here, got together the other night and perfected an organization which we hope will become an adjunct of this Congress. Our object is to cut out all fake advertising on dry farming land. The man who prints things that cannot be done, we are against, absolutely and strictly. The man who brings the homeseeker out here from the East or any place else on misrepresentation is worse than the grafter who takes money from a man with a three-shell game. He not only takes the man's money, but he brings his family out here and gets the man's money and the man has nothing left at the end of the season to show for it, and the rest of you have to support him. That is all wrong and we are against it. That resolution while not radical, is entirely in keeping with the new sentiment which has sprung up in the West against fake mining propositions. Now, we can stop this thing in its infancy, this agitation against dry farming. Dry farming is good; it is fine, and a man can earn a good living at it, but what is the use of misrepresentation? That is the reason we got together night before last, a big crowd of us, and organized this association, which is to brand every faker we can get hold of. We are going to expose them. I hope the Congress will adopt that resolution because it is on the square. That is how we want to be, is on the square. and I think this Congress is on the square."

C. E. WANTLAND, of Denver, Colo.: "I am in favor of this resolution. I realize that probably something else must be done besides a general denunciation of the men who are doing most of this kind of work. The men who are doing the legitimate business in the West are in favor of State Immigration Bureaus. They are in favor of giving official information over the seal of the state. They are in favor of having Uncle Sam knowing what they have to offer, and are not in favor of letting men make a filing on 160 acres on which they cannot make a living. They are in favor of not allowing them to go upon such land unless they know what they are doing. It is all very well to condemn the land broker, but in selling the Union Pacific Land Grant, we never allowed our men to locate men on government land, because we don't think he could make a living on 160 acres. Six hundred and forty acres was the amount we attempted to work for in selling Union Pacific land. A great many men have represented the conditions dishonestly and a great many men have misrepresented conditions without sufficient information and they have no way of getting information. The state has no Immigration Bureau and no officer in charge of immigration. The Government of the United States allows the homestead law to remain in operation where it never should have been allowed. I think in the resolution should be put something about classifying the land by the Government in order that Uncle Sam should not offer the temptation to beat people all over the United States; that is fair to every one."

MR. JEFFRIES, of South Dakota: "I would like to be heard just a short time because I am opposed to this resolution being adopted by this Congress. I would like to state my reasons, and the gentleman who has just preceded me stated the proposition in regard to a State Immigration Bureau. I believe we should have something affirmative and not incumber the resolutions we adopt here with something just merely denunctiatory. I don't think it would do what it is expected to do. In the State of South Dakota for the past year we have had a state federation of commercial clubsand the main object of that state federation has been to work up a sentiment to bring about the passing of a law by our State Legislature creating the office of Immigration Commissioner for the very purpose of which I speak, so that we can get something official, and I believe that unless we can incorporate some such resolution we will be merely incumbering the record with the resolution as offered in its present state."

A DELEGATE: "I move it be referred back to the Committee for further report."

MR. HASTINGS, Laramie: "I am opposed to this resolution for the reason that it is a very dangerous resolution. You are putting into the hands of a few irresponsible press agents who have little idea of what a good dry land farm is, the power to condemn certain lands, and I agree with this gentleman's sentiment that there ought to be a commission appointed which is capable of determining when land is capable of dry farming. I think this is a very dangerous resolution. I have had some experience in selling land. I represent a land company that has sold more than 100,000 acres of land in this country, and we encountered just such a press association in the person of one man, who has since been appointed to a very prominent position by the President of the United States and who took that opportunity to get a drive at dry farming because we failed to advertise in his paper. That is a dangerous point and I think this Congress ought never to pass such a resolution."

"MR. RICKER, Colorado: "There are some people who do not believe in dry farming at all, and I agree with the man who just spoke; I think it is a very dangerous thing. I think a resolution of that order would be misleading. It would give authority to presons who are not informed, or who held dispositions to say things which would be detrimental to the building up of our country with good citizens. Nobody would condemn a fake mining organization or a fake land organization any more than I would. I am sure the gentleman on my left who first spoke—I have no doubt he is honest. No one would want anything done which would be a detriment to the country, or which would work a hardship on the incoming settler, but I believe the convention would make a dire mistake if we go on record as issuing simply a condemnatory measure without qualifying it or making some provision to the contrary. Therefore, I second the motion made by Mr. Wantland."

MR. NOLAND: "Inasmuch as my motives have been somewhat attacked, I would ask that the resolution be read again, because we do not ask that this association we formed night before last—we do not ask that that be endorsed. I simply stated we had formed such an association and independent of the Congress we are going after fake advertisers of fake schemes, but we would like to have the Congress take us under its wing. It would be so much better for us. But this resolution has nothing to do with that. The only thing is, it asks that the Congress condemn fake land fraud."

"MR. WANTLAND: "I move the resolution be referred back to the Resolution Committee."

MR. NOLAND: "We are perfectly willing that it should be referred back; that is a good idea, beacuse I think if it ever gets back, it will come back stronger than it was in the first place."

MR. MORDT, Oklahoma: "I believe the sentiment is not quite clear. The sentiment of the resolution is that the West wants good farmers. We do not mean by the resolution to try and stamp anybody as a scoundrel, by any means. I am interested in it and I am a land man myself. I am interested in it because I believe it is time for the press to come to the front, without mentioning any locality, without mentioning any names, but to come out and tell the people what they really need out here. We cannot support advertising that calls for anybody who has no more than four or five hundred dollars. I believe it is our duty to tell eastern people who come out here that if they are going to succeed, a certain amount of money is required. Many have come without knowledge of this fact. I have been out here five years and a majority of failures in the West are due first to ignorance and second to a lack of money, and those two things ruin the people, and what I am after is this: I am going to try and enlighten the East as well as I can about the necessity of money to make a success, and when this resolution is adopted it will only mean the backing up of that statement."

Causes of Failures.

MR. JEFFRIES, South Dakota: "Nobody in this Congress or elsewhere will try to put a single straw in the way of the press. This Congress has nothing to do with that. This Congress is on record already in reputation as against things of that sort. But who is to be the judge of whether a piece of land is fit for dry farming or anything else? This gentleman said it requires a certain amount of money. How many men are there who have come here without a cent of money and made a success? I have heard man after man get up in this Congress and say that the year he struck the country he didn't have anything, and today they are well off; while others come with unlimited means and make failures. For that reason there is no necessity to condemn anything. We are known to be opposed to fakes, for that reason I move the resolution be rejected.

MR. MARTIN, Texas: "In order not to have this resolution resubmitted to the Committee. I will say I think the Committee acted on it as they thought best and I move to table the amendment and bring the resolution fairly before the Convention and if it doesn't suit the Convention, to let them turn it down. I move we table the amendment and vote on the resolution."

MR. IRWIN, Wyoming: "I would like to have just a word on this subject. It seems to me, gentlemen, that this convention should follow a conservative course, and not an erratic course. I wish to say this in regard to the conservative course:

Conquering the Desert.

"For the last 15 years I have watched the movement westward. I have owned land along the 100th Meridian in Nebraska that 15 years ago was regarded as not worth anything for farming purposes, but the most conservative man in the community today will say those lands lying right in Dawson County are worth from $50.00 to $100.00 per acre. Yet, none of us 15 years ago would concede that. Today, go out on the street as I have gone out during this meeting.

Prejudice Still Exists.

"I met one man who is enthusiastic concerning dry farming, and I met some other men equally intelligent, but who see things from a different viewpoint and who do not have certain knowledge, and they are denouncing the whole thing as an absolute fake. One of my best friends the other day asked: 'How can you tell a dry farmer?' I said: They have got seed sticking in their hair; and he said: 'No, just look for a fellow who looks like a real live real estate man and you have got one.' That man was honest; he didn't believe in this dry farming proposition. Here is a man who gets up and if he were doing that writing he would denounce all these men who are selling dry farming lands, as being fakes, while there is the young lady who this afternoon told us how they make positive successes of these things. Now, as the gentleman suggests, 'Who is going to be the judge? ' I would like to say this to you, let's be conservative let's give everybody a show. I feel that the American people have intelligence enough to decide for themselves, who are advertising fake propositions and who are not advertising fake propositions. And I believe too, that there are enough honest, intelligent newspaper men in this state of ours, in Colorado, in South Dakota and all over this Trans-Missouri country that will brand any fakir whether the Trans-Missouri Dry Farming Congress places its stamp of approval on this thing or not. I feel if any criticism can be offered concerning our Resolutions Committee, it is that already we have too much encumbering of our resolutions with things that should not have crept into them, and so I say to you, do not pass that sort of a resolution. Keep everything out of the resolutions except those things which are vital to dry farming interests and matters of which there is a possibility for honest difference of opinion. You cannot go out and meet ten men and find any two out of three of them that will agree with you in regard to this proposition, so just remember that one point—who is going to be judge of this thing. I am opposed, gentlemen, to the resolution."

MR. WAU, Wyoming: 'How are you going to advertise and secure—"

GOV. BROOKS, (presiding): "Gentlemen, we will have no discussion on the floor whatever. The motion before this Congress is on the adoption of this resolution as read. That motion has been amended by the gentleman from Colorado to refer the motion back to the committee, and an amendment has been offered to that, to table the entire amendment"

MR. NOLAND: "A man said to me today that when questions of this kind came up they should be referred to Mr. John T. Burns, Secretary of the Dry Farming Congress. We are willing to refer anything of that sort to Secretary Burns. I think that answers the question of who is going to pass on it.

MR. GEORGE, Montana: "This resolution only expresses our disapproval of fake advertising. Why should we turn down this resolution after presenting it. Our purpose is to put this Congress on a high plane; this Congress is to benefit the entire country, and no real estate agent is going to be hurt by disapproval of fake advertising. I wish to say that if we are going to continue as a Congress and make it a great congress, we have got to constantly stamp disapproval on anything that looks like a fake, and I think it our duty, as this matter has come up before the Resolutions Committee and it has given it careful thought, that we pass on it."

MR. CONKLIN, Nebraska: "Gentlemen, as a member of the Resolutions Committee I would like to thank the gentleman from Montana for expressing the opinion of the committee. When discussing this resolution we felt as a committee that this body should be dignified and honest enough in its transactions with the people of the world, to say to them fairly and squarely that anything we endorsed was without fake of any kind or description. It was for the purpose of adding to the dignity of this Congress that we accepted that resolution as we did. It was not in the interest of any real estate or loan men or promoters; nor was it against their interest that this resolution was passed. I will not take a back seat to any man sitting in this audience, as to his ability to sell land and loan money to farmers for the purpose of developing their land. There are men in this audience who know that no man in my section of the state of Nebraska has sold as much land in Nebraska as I have, or loaned as much money as I have in our country, and as I am doing today, and helping them to make homes for their families, and create crops. I have noticed during the 40 years I have been in the business, the absolute desire on the part of certain real estate men not to tell the absolute truth. Years ago when the great B. & M. Railroad Company of southern Nebraska were advertising all over the eastern country the land they had for sale, they were stating absolute falsehoods; there wasn't a word of truth in any pamphlet they sent out for years. I went down to Omaha and discussed that matter with John Francis, General Passenger Agent of that road, and who is now in Chicago—I said to him: If you want to sell these rough lands in Nebraska, these grazing lands in Nebraska, tell the truth and the absolute truth and bring these men from the East out here expecting to see rough land and not lead them to believe that these lands are great wide prairies, smooth and level as a floor. Every bit of that land in that state was rough at that time. We discussed that matter and they got out a pamphlet called 'Grazing Land in the State of Nebraska.' This was in 1890, when they spread 100,000 copies of that over Iowa and another 150,000 over Illinois and they sold every bit of land that they had in the state inside of the next twelve months. I tell you any business that will not stand under the limelight and will not stand being ventilated in every respect from bottom to top isn't worth having."

MR. SUDDITH, Montana: "It seems to me the convention has gotten itself into a nice position. I do not see how we can afford not to pass this resolution. The resolution is presented here to condemn fake advertising and a motion was made to refer it back to the committee, and another motion was made to put it on the table; if we put it on the table, the inference is we are in favor of fake advertising."

GOV. BROOKS, (presiding): "Gentelmen, the motion which you are to vote on is the amendment to the amendment which will place this resolution on the table and that would be equivalent to killing the resolution. The question is on the amendment to the amendment—the 'Noes' have it and the amendment to the amendment is lost. We will now vote on the amendment, which is to refer the resolution back to the Resolutions Committee. All in favor of that amendment say 'Aye;' those opposed 'No.' The 'Noes' have it and the amendment is lost. You are now voting on the original motion, that the resolution be adopted as read; all in favor of the resolution say 'Aye;' those opposed 'No.' The motion is adopted and the resolution accepted."

FARM STUDIES IN PUBLIC SCHOOLS.

PROF. CHILCOTT: "The next resolution is as follows: This resolution was handed to me by a member of the Resolutions Committee after adjournment of that Committee. I was told by the member that he had submitted it to the several members of that Committee and that there was no objections to it. If the Chair does not object, I will submit this resolution and move its adoption.

"RESOLVED: That we recognize the fact that one of the most potent factors in the promotion of Dry Farming along scientific lines must come from the education of the youth of our land in that scientific principles upon which successful agriculture rests, therefore we recommend the establishment of an adequate course of instruction along this line, with provision for practical experimentation and demonstration wherever possible, in all public schools, also that provision be made for the instruction of all teachers along this line."

Adopted by unanimous vote.

STATE EMMIGRATION BUREAU.

MR. WANTLAND: "Just as a matter of courtesy, as I favored a motion a little while ago concerning advertising and asked to have it referred back in order that it might be amended, I would like to submit this amendment:

"RESOLVED, That the Dry Farming Congress favors the creation of State Immigration Bureaus by the Western States in order that official information may be furnished to intending homeseekers."

GOV. BROOKS, (presiding): "The Chairman holds that you are out of order. That resolution has passed."

MR. WANTLAND: "I present this now as an independent resolution."

GOV.. BROOKS (presiding): "Notice was given that all resolutions must be in by twelve o'clock today, and unless the committee approved them they cannot be presented now."

PROF. CHILCOTT: "I have no objection. As chairman, I would recommend that it be accepted."

A DELEGATE, Montana: "I move the adoption of the resolution."

Motion duly seconded and carried.

GOVERNMENT EXPERIMENT STATIONS.

"WHEREAS, The need of information of the farmer in the arid region is essential and necessary, therefore, be it resolved that we urge the Federal Government to establish at least twenty experimental and demonstration farms, in each of the so-called arid and semi-arid states, the purposes of which will be to develop and introduce varieties of grain best adapted to each locality and to demonstrate methods of cultivation, improving and caring for the same."

Adopted by unanimous vote.

COUNTY EXPERIMENT STATIONS.

WHEREAS, After the State and Federal Governments and forerunners in the dry farming movement have worked out the principles of dry farming in a general way, the practicability thereof, must be demonstrated to the farmers in their respective communities, before they will be adopted in general practice, and,

"WHEREAS, Such demonstrations can best be made, by some capable, enterprising farmer in each county, and,

"WHEREAS, The farmer best qualified to perform the task is often unable to bear so great an expense, therefore, be it

"RESOLVED, That the individual members of this Congress be urged to use their utmost efforts to obtain such legislation in their respective states as will enable the Board of County Commissioners of each county to make appropriations from the funds thereof, to assist in the work of demonstrating the practicability of dry farming in their midst."

THANKS AND CONGRATULATIONS.

"WHEREAS, The entertainment of the delegates to the Congress has been hospitable, be it,

"RESOLVED, That this Convention tender its heartiest thanks to the people of Cheyenne, Wyoming for their most gracious reception and entertainment, their princely hospitality, and their genial good will towards every visitor, the Congress having been one of the most successful ever held or that ever will be held in the measure of hospitality and entertainment offered the guests of the city;

"That special thanks be extended to the citizens, who opened the doors of their residences and homes, for the accommodation of the visitors and made their stay pleasing.

"That, thanks be extended to the Hon. Bryant B, Brooks, Governor of Wyoming, for his time in presiding over many of the deliberations of this body; and to the Mayor of the City of Cheyenne, Wyoming.

"That, the Industrial Club, the Elks' Lodge, the Masons of the city, and all other officials, be thanked heartily for the many courtesies extended to the visitors;

"That the retiring officers of this Congress, be given thanks for their work during the past year; for the time they have spent in this Congress, and in advancing the cause of dry farming, and that we congratulate the Executive Committee on its re-election of Mr. F. C. Bowman, as Chairman and Mr. J. T. Burns, as Secretary, and that we especially thank these two officers for their untiring work;

"That the hearty thanks of this Convention be extended to the press of Cheyenne, Denver and other localities for careful reports given the proceedings of the Convention, thus spreading and disseminating the information before the world, regarding this great movement;

"That each foreign Government having a representative at this Convention be sent a special vote of thanks for the courtesy and that the delegates themselves be thanked for the time, trouble and expense, they have given to the cause in coming here to meet with us, and give us the benefit of their experiences;

Adopted by unanimous vote.

DATE OF ANNUAL SESSION.

MR. BOWMAN, Idaho: "The resolutions committee referred one resolution to the executive committee, which I wish to offer as follows:

"RESOLVED, that the importance of having a large and comprehensive dry farming exposition in connection with the meetings of the Dry Farming Congress makes it necessary that the annual sessions of this Congress shall be held at some date during the month of November, and that it is the sense of this, The Third Congress, that this rule be established, beginning with the fourth meeting of this organization."

"I move the adoption of this resolution."

DR. SUDDUTH, Montana: "I move an amendment to the resolution changing the date to October, for the reason that in coming to Montana our best weather is in October; our conventions are all held in October. Between November and December we have our equinoxial storms and we are liable to get a storm after that time. After that time we have nice weather up to the first of February. Now it seems to me when the facts are known that it would be better to put it in October than November."

GOV. BROOKS, (presiding): "Did I understand your amendment read either October or November?"

DR. SUDDUTH, Montana: "I do not want to disagree; I simply desired to state that as a matter of fact, and I will withdraw my motion."

PROF. TOWAR, Laramie: "I wish to say on behalf of the directors of experiment stations that they annually have to go to the

City of Washington for their annual meeting, therefore, I would like to have the motion so changed that it would not of necessity come during the month of November when so many of us have to go to Washington."

MR. BOWMAN: "I will say in answer to Prof. Towar, we have some experiment station men on the executive committee and that was discussed and all agreed that after the 15th of November they were free. The question of October was discussed and several states including my own, stated they could do nothing in October. We could not go to one at that time and it was the sense of the Montana people that just after the 15th of November would be a good time and would not interfere with the experiment stations. However, the absolute date is left to the Executive Committee and of course we want to see that the session is a success and all these various matters and conditions in the city where the session is held will be taken into consideration before the date is set. All that the committee wanted to get was the general sense of the Congress, whether to meet in the fall or the spring."

PROF. TOWAR: "Answering that, I would say, as a rule these director's meeting in Washington begin about the 10th of November. The National Livestock Show is about the last two or three days of November and a large majority of the experiment station men make the trip, starting from here about the first of November and spend a good portion of the month. The meeting this year began on the 10th and lasted until the 20th of November, in the City of Washington."

GOV. BROOKS, (presiding): "As I understand the question, it is simply an indication that the fall meetings are preferred, but still leaves the matter entirely in the hands of the Executive Committee. The Chair is not exactly clear on this. It seems to me we could leave it to the Executive Committee."

MR. BOWMAN: "I do not know who offered it; somebody offered the resolution to the Resolutions Committee, and they referred it to the Executive Committee, and feeling that somebody wanted the meeting in the fall, it was taken under discussion in the Executive Committee, and decided to put it before this Congress in this manner."

GOV. BROOKS (presiding): "It strikes me from careful listening to the resolution that it pretty nearly instructs the Executive Committee to call the Congress during November. That may be desirable in some states and in some states it may not. It strikes me that we have a pretty good Executive Committee and we should leave it to their discretion'.'

A DELEGATE: "I move the resolution be laid on the table."

A DELEGATE: "I second the motion."

A DELEGATE: "I am afraid we will make a mistake if we lay that on the table."

GOV. BROOKS (presiding): "The motion before the congress is that the resolution be adopted as read."

A DELEGATE: "Being a member of the Resolutions Committee, we did not feel like taking any responsibility in this matter. Personally I am opposed to the fall session. While I realize fully we cannot get pumpkins and squash in the winter season and the fact that exhibits grown under dry farming have great interest for the delegates, yet at the same time it seems to me that when it comes to consulting the convenience of farmers, the men who ought to be actually represented in these meetings in large numbers, I am afraid we impose a hardship on him, to compel him to attend a convention in that season of the year. My experience is that a farmer is busy up until the snow stops his work in the fall. After winter sets in, then he has leisure again. It seems to me that the most opportune time is at this season of the year, notwithstanding the snow blockade."

GOV. BROOKS (presiding): "The motion is on the adoption of the resolution as read."

MR. DEMING, Wyoming: "It seems to me that the matter of the fixing of the date of this convention or Congress, can be better worked out by the Executive Committee made up from various sections of various states much better than by the convention trying to set it in any one month, because one year it may be held in Montana and another year it may be held in Texas, and local conditions must be taken into account. Therefore, I move an amendment to the resolution, that the fixing of the date for the annual convention be left to the Executive Committee.

GOV. BROOKS (presiding): "Is that necessary? It is that way now."

MR. BOWMAN: "I will withdraw the resolution, with the consent of my second."

HONORARY LIFE MEMBER.

SECRETARY BURNS: "The following telegram is authorized by the Executive Committee, to Hon. Frank W. Mondell:

"Cheyenne, Wyo., February 25, 1909.

"Hon. F. W. Mondell, House of Representatives, Washington, D. C.:

"The Dry Farming Congress in convention assembled extends to you its congratulations upon your splendid work in behalf of the arid districts of the West in securing the passage of the three hundred and twenty acre homestead law. This Congress has made you an honorary life member.

"THE DRY FARMING CONGRESS.
"B. B. BROOKS, President."

GOVERNOR BROOKS (presiding): "Before calling for the other address on the program this afternoon, I am going to invite Dr. MacDonald, of the Transvaal, who is compelled to leave on tonight's train, and who wishes to say a parting word to this convention, to come to the stage."

THANKS FROM BRITISH DELEGATE.

DR. MACDONALD: "Ladies and Gentlemen: You must be very tired by this time of the day, and I do not wish to detain you more than a few moments, but in these few moments I wish to convey to you on behalf of the Government of the Transvaal and the British Colonial Office my most hearty thanks to his Honor, the Mayor of Cheyenne and to every citizen for the magnificent hospitality with which you have received the delegates. In the words of the distinguished gentleman from Brazil: 'It is so impossible to feel homesick in Cheyenne.' And there is one thing that I like to think of, and that is that you have raised a countryman of my own to the highest position in your city. I refer to the mayor. I believe Mr. Cook hails from the city of Aberdeen, a town, gentlemen, which has long been renouned for sending forth to the United States and the British Empire men possessed of character and enterprise, which I am assured are eminently possessed by your worthy mayor. But I think, gentlemen, that he would allow me to claim a quality which perhaps he does not possess in such an eminent degree. I refer to the quality of prophecy, or what in the West is termed second sight, and I wish so to use that quality tonight, and to say to you that I make bold to prophecy that your beautiful city, standing as a sentinel at the gate of this great state, is destined in the near future to become one of the most splendid cities of any in the West. On returning home I shall not hesitate to convey to the Prime Minister of the Transvaal and to the Secretary of State for the Colonies my most eloquent appreciation of the splendid welcome which you have given to the humble representative."

HOW I MADE GOOD AT DRY FARMING.

By E. R. Parsons, Dry Farmer, Parker, Colo.

MR. PARSONS: "I have been dry farming in Colorado since 1880. In those days they used to call us dry prairie farmers and drylanders, not because they thought we farmed without moisture, but becouse we farmed the dry prairie or land which was dry before we farmed it.

Alfalfa Corn.

"Before coming to this country I had already had some pretty dry farming experiences in South Africa raising alfalfa or lucerne, as they called it there, and corn. My methods of agriculture were naturally those of England and other European countries, where the most intensive and scientific form of farming prevails, some of the land having been under cultivation for a thousand years and still averaging its thirty bushels of wheat to the acre.

Soil Treatment.

"Over there they plow from ten to fifteen inches, and fallow between every crop, to keep the weeds out and accumulate plant food.

They also roll and pack to some extent, rotate their crops, and have cultivated small grain since the sixteenth century with implements made on purpose.

Summer Fallow.

"It did not take long to discover that clean fallowing between crops, besides keeping the weeds out, was also the very best way to accumulate moisture, and that deep plowing was vastly superior to the ordinary shallow plowing of the West, for catching that moisture, in the first place.

"On my present ranch I commenced operations with 160 acres. With the help of twenty cows, some pigs, bees and chickens, counting what we used up on the ranch, our income amounted to about three dollars a day.

Live Stock and Forage.

"Since 1890 I have been continually adding to my ranch and now own about 1,200 acres, and make my money out of steers, selling fifty every fall,—alfalfa, corn and fruit. I also raise winter wheat and all the chicken, horse feed and garden stuff used on the ranch.

Conservation of Water.

"My formula for raising crops has always been, 'Get your mois ture first, then raise a crop on it.' The most practical way of doing this, is to take no chances from the start, but figure that every year is going to be a dry year with the minimum precipitation during the growing season.

Precipitation.

"In my part of Colorado the minimum precipitation during the growing season in thirty years has been about two to two and a half inches. To meet this and raise a crop without fear of failure, I find we need to start out at planting time with at least three feet of moisture in the ground from the surface down, about twelve to fifteen per cent. wet, or over.

Summer Fallow.

"Failing this amount of moisture, it is best to lay off the whole patch for a season, or part of a season, and clean fallow it, until the necessary amount has accumulated. But as a matter of fact, I seldom have to do this perhaps not once in five or six years for by keeping the crust broken, summer and winter, we usually find that we have in the spring the necessary moisture to commence operations,

Deep Plowing.

"The most profitable way of operating is naturally to raise crops as often and continuously as possible, which necessitates obtaining the greatest amount of moisture in the smallest amount of time. This can best be done by deep plowing, followed of course by fallowing.

Twelve inch plowing, supplemented by fallowing, will accumulate in a given time about twice as much moisture as six or seven inch plowing followed by the same amount of fallowing. It is also easier to hold moisture in deep land than shallow.

Soil Treatment.

"When the corn has been harvested, after an average season, if the plowing and cultivation have been good, there is usually some moisture left over, probably from one to two feet, about ten per cent wet; then by disking and cultivating as soon as possible and keeping the land open all winter and spring, we can usually secure at least three feet of moist soil by planting time, and if this three feet contains about twelve to fifteen per cent water, a fine crop can be raised on it with the minimum rainfall of two to two and a half inches during the growing season; but with the average precipitation of five or six inches, the crop should run to nearly 40 bushels.

Acreage Yields.

"Four feet of moisture of course is a little better than three feet, but not enough to pay for laying off the patch a whole year to accumulate this extra foot..

Deep Plowing.

"The same with plowing; fifteen inch plowing will raise to the acre a few more bushels than ten or twelve inch plowing, but not always enough to make it profitable to keep an extra man and team to sub-soil down to fifteen inches.

Moisture Test.

"The easiest way to test soil for moisture is to take a few pounds, weigh it and then bake all the moisture out of it, then weigh again,—the loss of weight of course is the amount of water gone out of it by evaporation. The moisture in the subsoil usually runs pretty well after a wet winter like the present, but should it turn as low as six to eight per cent. in the upper three feet from the surface down, the man who plants a crop on it is takng chances, and it had better be laid fallow for a whole season when it will accumulate enough moisture to carry crops for several years successively.

Summer Fallow.

"In other parts of the West where the precipitation is less than we have here, it may be found necessary to fallow almost every alternate year.

"And the question as to whether you fallow or not should be decided by the amount of moisture you have at that time in the field, and not by any hard and fast rule of fallowing just so often.

"My object in dwelling so much on this moisture question, is to show that by eliminating all elements of chance, we can make of this dry farming business, almost an exact science. The everyday settler

Deep Plowing.

that comes here to dry farm without the requisite knowledge, plows about six or seven inches, and the roots of his crops go that deep and no deeper, but if you can persuade this man to plow deep, he will have a much better chance of raising a crop and also of accumulating some moisture in the sub-soil for succeeding crops.

Depth of Moisture.

"But the most significant fact of all is this: If you can secure three feet of moist soil by planting time, and this soil is twelve to fifteen per cent. moist, the roots of your crops will go into it and you are then bringing into action three feet of soil instead of seven inches.

"This is the whole secret of raising thirty and forty bushel crops instead of fifteen and twenty.

Percentage of Moisture.

"The roots of trees, small grain and corn all vary as to their penetrative qualities. I find that tree roots will penetrate almost anything soft or hard that contains even a low pencentage of moisture. Small grain crops come next, and will go three or four feet into a sub-soil that contains ten to twelve per cent. of moisture, but the roots of corn work laterally as soon as they strike the hard pan, and it requires some fourteen to sixteen per cent of water in the subsoil to coax them into it; therefore there exists the greatest need of plowing all corn land as deep as possible to facilitate the downward trend of the roots.

Capillary Action.

"I find that Capillarity works much more freely downward with the help of gravity, than upward. In my clay loam soil, which I have carefully tested, I find there is no upward movement of moisture by capillarity unless it is about fifteen per cent. wet or over; on the other hand the moisture seems to work downwards, even when the percentage is very low, but this exact percentage I have not yet been able to determine. I am convinced however, that much has been attributed to capillarity which is really due to the movements of the water vapor in the pores of the earth, both upward and downward, especially in summer when the ground becomes warm and converts some of its moisture into vapor, which we hold down by cultivation, the earth being much more porous than is generally supposed.

Deep Plowing.

"The practical depth I believe, for the small farmer to plow, is just as deep as he can go with one team of three or four horses, without keeping an extra team and man for sub-soiling. On my ranch, this depth seems to be about ten to twelve inches. My position on subsoiling is this: it undoubtedly produces more grain to the acre, but the question for the farmer to settle is: Does the extra amount harvested justify the extra expenditure? I believe that if a man makes a business of raising grain for market, it does; otherwise, it does not.

Conservation of Moisture.

"Some people say it is impossible to keep deep plowed land in good tilth. My experience of thirty years in this matter is exactly the opposite, and I farm chiefly in clay loam. The deep plowed soil takes longer to bake and settle into a solid condition, holds more moisture without running off, and conserves more moisture in the sub-soil, and good tilth depends primarily on the right amount of moisture. Deep plowed land needs less cultivation, for instance, corn land plowed ten to twelve inches and cultivated twice, will yield nearly twice as much as land plowed seven inches and cultivated all summer.

Causes of Failure.

"My experience with sod is, that if you plow it three or four inches, Kansas and Nebraska fashion, it dries out and does not rot and sowing anything on it is like trying to raise a crop on a rag carpet."

Soil Treatment.

"We disc our sod land when wet in the summer or fall, getting down if possible about three inches, than plowing five inches deeper, making eight inches in all, then disking again and fallow until spring, then disk and harrow until as fine as old land before planting. Sod treated in this manner, holds moisture wonderfully well, rots perfectly and will raise a first class crop of anything.

"At a depth of eight inches, the plow gets below the grass mat, and throws up enough earth to help make a better seed bed than when plowed shallow.

Wheat-Rye.

"If winter wheat or rye crops are desired, they can be planted on sod prepared in this manner even in the fall and will usually produce fair crops.

Irrigating Not Necessary.

"Some of our agricultural men are in favor of providing our settlers with wells, to irrigate a few acres. Now I believe myself that if a man has no confidence in dry farming he will never make a dry farmer. As soon as a man understands the business he has no use whatever for irrigating, because he can raise crops more cheaply than by irrigated farming.

Alfalfa.

"My alfalfa costs me in actual work about 75 to 90 cents a ton in the stock. It costs the irrigator in labor and water from $1.90 to $2.00. The same with all crops where land is cheap and plentiful,—the advantage of irrigation being to produce a heavy yield on a limited area.

"There are two classes of settlers. Those who are naturally brainy and eager for information—this class succeeds anywhere. The other class are those who want to farm like their grandfathers did back east,—these are hard to convert, but I find that if you can once get them started to plowing deep, the rest comes easy.

Implements.

"One of them was farming a year or two ago with a sulky plow and two horses, plowing about six inches and raising about ten to fifteen bushels of oats to the acre. One year when he was rather disgusted with the outlook I persuaded him to drop the sulky and hitch onto a hand plow and plow nine inches, which he did. The result was thirty bushels. Now he comes around all the time to get pointers, and has set out an orchard which is doing well.

Diversified Cropping.

"I believe however most thoroughly in combination, or mixed farming. Even on 160 acres a man can feed his own stuff to stock and it certainly pays better to do this than to let some other man feed it. And even a poor farmer can feed his stunted and immature crops to cattle and make his food and clothes out of it.

Dry Land Orchard.

"I will now explain my dry orchard business, which has proved very profitable, and the principles involved.

"To make an exact science of this branch of dry farming, you take no risks whatever by getting your moisture first, before planting your trees, and then by bottling in the sub-soil more than the trees can use up, you render your orchard absolutely drouth proof.

Soil Preparation.

"I started by planting a small family orchard in 1886-7. I fallowed the ground after plowing a foot deep, dug the holes in the dead furrows to fill up with snow during the winter and secured about three to four feet of moisture from the surface down before planting a tree. I would cultivate about ten or twelve times during the summer after all the heavy rains, and even in winter after a thaw, when I had a chance to bottle a good snow. We soon had all the small fruits we wanted and apples began to appear on the trees.

Depth of Moisture.

Conservation of Moisture.

"By cultivation the moisture kept gaining and by 1895 this little orchard contained twelve feet of moisture from the surface down. I was getting more moisture than the trees could use up. This fact alone demonstrated at once that the moisture question was forever solved as regarded trees.

Commercial Fruit.

"This orchard was planted on what was originally dry buffalo grass prairie, not in a draw, but on a flat side hill, and on the grass alongside the orchard there was no moisture showing at any depth. This success determined me to plant a commercial orchard, which I did in 1895, starting with about 2,000 trees, apples, cherries and plums. This orchard acted (if I may use the expression) exactly the same as the other one, showing that my conclusions were correct. The fifth year the cherries and plums had paid for the orchard to date, and since then, with two bad years, I have sold from $3,000 to $4,000 worth of cherries, plums and apples.

Field for Orchardists.

"There is an immense field for this business in the plains region,—people will come a hundred miles to get cherries, do their own picking, pack them home and can them for winter, glad to get them at any price, and the sour cherries are the best drouth resisters and hardiest trees I know of, and will stand anything most, but seepage,—over irrigation and floodwater. My friends who irrigate have long ago killed theirs out and rely on me for their cherries.

"My orchard is on a flat side hill facing east. I protect the cherries from flood water from the hill by deep furrows on the outside of the orchard.

Depth of Moisture.

"By up-to-date, careful cultivation, I have accumulated nearly twenty-five feet of moist soil from the surface down. On the prairie adjoining, there is no moisture at any depth. The top three feet contains the highest percentage of moisture, and most of the roots. In the spring the top three feet is ofter from fifteen to twenty per cent. wet, but gets drier little by little as you go down. At about twenty feet the clay is dry and crumbly.

Drouth Resistant Trees.

"The only effect of the last dry season, the driest in thirty years, was to reduce the moisture in the top three feet from fifteen to twenty per cent. down to about twelve to fifteen per cent. A tree can live very well in six to eight per cent. and can winter in less than that. Therefore it is easy to understand that an orchard in twenty feet of moist soil securely by cultivation is absolutely drouth proof for one dry year, or half a dozen. Now comes the question,—will this balance of moisture in our favor continue indefinitely as the trees grow larger-The answer is,—it will, provided you give the trees room enough.

Planting the Orchard.

"My experience shows that apple trees planted twenty feet apart, will hold their own, and bear good sized apples up to ten years and over. From ten years up to full growth, forty feet is necessary in order that the trees may not use up the moisture more quickly than you impound it.

Conservation of Moisture.

"I will now show by a single calculation that a full grown apple tree cannot use up all the moisture that falls on a square of forty feet, provided this area is scientifically cultivated. A square of forty feet contains 1,600 square feet, a cubic foot of water weighs 62.33 pounds. Now with a precipitation of twelve inches, we have exactly 1,600 cubic feet, which is forty-nine tons of water per annum to each apple tree. With a precipitation of fourteen inches, we get one-sixth more, equalling about fifty-seven tons to the tree.

Demand of the Tree.

"The botanists claim by actual experiment that a twenty foot apple tree will use up and transpire into the atmosphere during the four growing months some ten to thirty gallons a day or fifteen tons for the season. The horticulturists say it takes a ton of water to make a barrel of apples; allowing for ten barrels of apples per tree another ten tons is used up. That makes twenty-five tons used up out of fifty-seven, less than half. We can then allow fifteen tons for run off and waste and a surplus will remain in the subsoil of ten tons per tree every year.

Fourteen Inches Precipitation for Fruit.

"If the above amounts are checked off with the amount of water found to have accumulated in my orchard during the last twelve years, they will be found approximately correct, and these show that it would be quite feasible to raise trees and fruit with even less precipitation than fourteen inches.

"I allow forty feet for apples, twenty feet for cherries and plums, and ten feet for small fruits.

Holding the Snow.

"In localities where it is necessary to secure all possible moisture, some increase can be obtained by the snow fence method. This can be applied to any land. Throw up back furrows with the plow every twenty feet at right angles across the path of the blizzard, as high as possible; one man and team can do twenty acres a day. This device will often cover your whole field with a foot or more of snow drifts when the rest of the prairie is perfectly bare.

"After the trees attain some growth they catch their own snow, and it often banks up in the orchard two feet deep. More moisture also can be accumulated by plowing, as well as cultivating, but not too deep on account of the roots.

Shade Trees.

"On these same principles any upland shade tree can be raised that will stand the winters. Very few trees are ever killed by drouth anywhere. It is always winter killing that does the damage. Trees around the house should not be potholed, but should be treated in the same manner as the orchard trees; for a single row a strip should be plowed twenty feet wide. The rule of cultivating is, of course, break the crust, fill up the pores, hold the moisture.

Dry Land Orchards Resist Cold.

"We cultivated the orchard twelve times last year, and also after the thaw this month to bottle the big snow. Trees winter best in medium dry soil and do not winter-kill as much in the dry orchard as they do in the irrigated orchard. In 1896-9 when so many apple trees were winter-killed in different parts of the West, I did not lose a tree. The trees that winter-kill are those which become too sappy in the warm spells from excess of moisture about the roots. The sap cells fill up and when a freeze comes, the expansion ruptures them. Nature gives us a dry fall, which is best for trees, as they become more dormant and the sap cells not being gorged, leaves plenty of room for expansion.

Altitude Effect.

"Altitude increases winter-killing, on account of lack of air pressure, the weight of the atmosphere being quite an important factor in holding down the expansive power of frozen sap. Therefore, we find that at a high altitude, too much moisture is worse than not enough and for this reason seepage, or even too much flood water late in the summer are very dangerous things for all fruit trees and even for upland shade trees. But cottonwoods, boxelders, soft maples, willows and most of the poplars will stand seepage. These of course should all be cut out by the dry farmer.

Dry Land Trees.

"The following can be raised on the dry farm in localities where they do not winter-kill: Locust, elm, black walnut, silver poplar, catalpa, live oak, black oak and the yellow pine and red spruce or Douglas fir. Evergreens must be transplanted with a ball of earth,—exposure of the roots is fatal. Under two feet is the best size.

Best Dry Land Fruit.

"The best cherry tree is the Montmorency,—Morello bears more and is good to plant, although a little less hardy.

"Plums must be very low headed to do well, some of the best are the Italian prune, German prune, Tatge and Lombard.

"Apples are very hardy in the dry orchard, and almost any variety can be planted. My favorites are Yellow Transparent, Jonathan, Bonne Beauty, Wealthy and Winesap.

"The best trees are those that can pass the warm spells in winter without starting the sap. Missouri, southern Nebraska and Kansas trees have done the best with me. The northern trees need steady, cold weather, and are not always suitable to our hot and cold winters."

Ninth Session, Thursday Evening.

Garguilo's Concert Band gave a concert from 7:45 to 8:15 o'clock, at which time the Congress was called to order by Chairman Bowman, of the Executive Committee.

DRY FARMING IN WESTERN SOUTH DAKOTA.

By Mr. C. L. Millett, of Ft. Pierre, South Dakota.

MR. MILLETT: "It is a great pleasure to meet with and look into the faces of men who represent the greatest industry of all industries; the industry of agriculture. It is the foundation industry of our nation.

"Your interests and enthusiasm bespeaks deeper interest, more practical effort and larger results hereafter, than has been attained in the past.

"The subject I will endeavor to present is given as Dry Farming in Western South Dakota. I shall, however, confine my statements to Stanley county, about which I am better informed than about the entire western part of our state.

"In March, 1887, almost twenty-two years ago, I left southwestern New York, the land of my birth—and a section of country noted for its beautiful landscapes—coming direct to Pierre, on the Missouri river in South Dakota. At that time I first saw the eastern slopes of Stanley county, then in the great Sioux Indian reservation, opened for settlement in 1889. For a number of years after my arrival at Pierre, climatic conditions were very unfavorable, hot winds and drouth being the rule rather than the exception. For a number of years I was engaged in the cattle business to some extent and have spent many days in the saddle, riding over the rolling prairies of Stanley county. Oftentimes I have thought concerning the possibilities of that soil and wondered if the land would ever be of sufficient value to become permanently and thickly settled.

Campbell System.

"Something like three years ago there fell into my hands a copy of the Century magazine, in which I found an article on scientific farming in the arid west. That article brought a new revelation to my mind and since that time I have been an ardent disciple of the scientific methods set forth by Hon. H. W. Campbell, and others, concerning proper methods of handling the various soils of our great West.

"Stanley county lies immediately west of the central portion of the state with the Missouri river as its eastern boundary line, the Cheyenne river as its northern boundary line, and the White river for over fifty miles as its southern boundary, and contains about 4,800 square miles. Many fossils,—petrified sections of fish and reptiles, found in many parts of Stanley county, show that in ages past either an extension of the Gulf of Mexico extended north and covered our section of South Dakota, or a great inland lake existed there. The deposits left from the water that must have stood over that territory for ages has made an exceedingly rich soil. The western line of the glacial drift, except in a few places, does not show west of the Missouri river, hence the soils in our county are entirely different from those on the upland prairies east of the Missouri river. We have a soil that is adhesive and sticky in its properties and very difficult to cultivate and farm when wet. In the northern part of Stanley county we have thousands of acres of table lands lying back from the Cheyenne river for several miles that is often spoken of as the Woming or Laramie drift. Those table lands are composed of a rich gravel loam, very productive,—on entirely different soil from the gumbo soil covering the other parts of our county. The rest of the county is of a rolling nature, quite rough in sections, in others only slightly rolling, and very satisfactory for cultivation, the altitude being 1,457 feet on the Missouri river to 1,500 feet on the divides between the White and Cheyenne rivers.

Campbell System.

"Thus far we have been carrying out the principles of scientific soil culture as recommended and set forth in various publications by H. W. Campbell, of Lincoln, Nebraska, It has been demonstrated beyond a doubt that this system of farming is a great success in our country—that fall plowing and fall crops produce better results than spring crops. However, we are getting very good returns from spring crops.

Deep Plowing.

"Deep plowing is necessary, seven to nine inches being the rule, with thorough cultivation after every rain. The fourteen inch disc has been the one most effective tool in fitting the ground before seeding.

Sub-Soil Packer.

"At this time we have not sufficiently tested the use of the machine known as a 'sub-soil packer' to know its value. I have such a machine that I used last fall on all plowing and shall use on spring plowing in order to be able to judge the value and importance of its use—connection with dry farming.

Gumbo Soil.

"In our section the clay soil is commonly spoken of as 'gumbo.' A close examination of this soil shows the particles to be very small and very many of them of cubical form. It will absorb a large amount of water because of these very fine particles, fill a can or jar and see. After the virgin prairie is once broken up and thoroughly cultivated it becomes loose, is very easily worked if taken at just the right stage

Conservation of Moisture.

of moisture, never leaches, and a cultivated field acts as a permanent reservoir for all water that falls upon it if the farmer is careful to prevent evaporation. The intelligent farmer is able to raise many kinds

Diversified Cropping.

of crops successfully, a few of the main and most successful crops being winter wheat, winter rye, corn, alfalfa, potatoes, sugar beets, oats, barley and speltz. I am interested in a cattle company that has under cultivation 100 acres of land three miles south of the Cheyenne river on one of the table lands above mentioned, where we have successfully raised crops for the past seven years, fully one half of said years being dry ones. The first four years did not bring as good results as the last three for the reason that the principles of dry farming were not know to us then. During part of the same time my partner and myself have been cultivating a small farm near Fort Pierre, on the eastern edge of Stanley county, with success. We find

Root Crops.

the gumbo soil raises unusually large root products of all kinds and is especially adapted to the growth of sugar beets and alfalfa. Our potatoes have proven extra fine in quality and size, producing 125 to 150 bushels per acre. We are usually able to plant potatoes in April so that they mature about the middle of July.

Gumbo Soil.

"In certain parts of our county we have a very heavy gumbo soil which would seem to require more careful handling than the soils of the table lands on the river bottoms. This heavy soil has not been farmed scientifically up to the present time so as to be able to report results. In our gumbo soil we have all of the most valuable elements needed to sustain plant life, these soils being very rich in phosphates and nitrates. On the ridges we find in many places shale close to the surface. These shales, however, as soon as exposed to the air and sunlight quickly slack, very much the same as quick lime. We have underneath our county some of the largest and deepest beds of shale known in the world, these beds being from 1,000 to 1,200 feet deep.

Precipitation.

"The report of the United States weather bureau at Pierre shows an average rainfall of over seventeen inches each year for the past thirty years, which is sufficient for nearly all purposes. Trees can be successfully grown if set in rows and the soil well cultivated. The cultivation should be thorough in the dry periods.

During the past years 1907 and 1908 four banks in Stanley county distributed free something like 1,500 of the Campbell Soil Culture Manuals and other matter treating on this subject. The newspapers have also published much matter, all of which has assisted in introducing the new methods of soil culture. The interest of a great many of our farmers in this subject is excellent and we shall see results soon. Only a few farmers have been able to conduct experiments but success has attended the few that have tried.

Acreage Yields.

"Near Cottonwood in the western part of the county in 1908, Mr. Levi Burgstahler raised twenty-nine bushels of winter wheat per acre on forty acres. At our ranch in northern Stanley county, spring wheat made about twenty-five bushels and oats forty bushels, in 1908.

Experiment Stations.

"The state of South Dakota is about to establish an experimental station at Cottonwood where we believe many experiments will be made in dry farming and a more thorough demonstration made as to the proper methods required to get best results from our gumbo land.

Deep Plowing.

"On the McPherson truck farm, ground that was plowed deep in the fall contained a good deal more moisture the following season than the spring plowing contained. The greatest difference in the amount of moisture, however, was noticed in connection with different degrees of cultivation.

Soil Treatment.

"Potatoes cultivated twice made a poor yield. The ground became hard and dry and cracked open in August. Potatoes plowed four or five times yielded better and the ground kept considerable moisture in it. The same experiments with different plots of sweet corn had similar results. The corn that was plowed frequently kept its green color longer and did not fire at the bottom.

Vegetables.

"Vegetables that were continually cultivated made as fine products as one would care to see. Wherever the cultivation was continued, the ground kept moist until the entire crop was harvested.

Acreage Yields.

"The fact that the produce from eight acres was sold for a little over $1,200 cash, determines that dry farming is not a failure in Stanley county, South Dakota.

Result of Methodical Work.

"Mr. E. Shaffenberg says: 'I will tell you as best I can how I began breaking prairie and seeding last spring until I had broken and seeded sixty acres on my own homestead. At the same time kind people told me I was putting too much work on my land, that I was working the life out of it, but I kept on as I had started and my good neighbors and friends watched results. Some of them had farmed before and knew they were right. It was all new to me in this climate where the soil conditions were so much different from Iowa and Nebraska.

" 'But I succeeded. It was a surprise to all who saw the crop at time of harvesting and threshing. We threshed flax, wheat, oats, speltz, buckwheat and millet seed, and this all on new sod. Together with the small grains I experimented with many varieties of farm products with all of which I am credited with having produced good results.

Diversified Cropping.

Among these were four varieties of corn, besides popcorn and broom corn. Six varieties of potatoes, amber cane, kaffir corn, many varieties of pumpkins, squash, melons,, muskmelons, turnips, beets, and so on down the line until with grasses, clover and alfalfa we had in all about fifty-six varieties comprising the sod crop.

" 'I will endeavor as briefly as possible to give you my opinion of the growth and condition of this crop along through the season and at maturity. Understand the ground had to be broken before it could be planted and therefore some of it necessarily had to be put in later than would have been the case had the ground been broken and ready for the crop.

Soil Treatment.

" 'The first breaking was done as early as possible and this was for potatoes. This was broken as shallow as possible in order to split the buffalo sod which then rots very fast. Every evening after the day's breaking the disk was put on and the land was pulverized down smooth.

" 'In this way we prevented the soil from drying out and preserved the moisture. The turf handles much better when the soil is moist and freshly broken. After the potato ground was thoroughly disked we started in breaking for small grain and flax and in preparing this we disked it until we had a seed bed in shape for the disk drill which I consider by far the best method of putting in seed.

Potatoes.

" 'After putting in the small grain we were ready for the potatoes and garden. We used the Good Enough Riding Breaker again on the potato ground, which we had broken and disked two weeks before, but this second time we put the plow down five to six inches so when completed the sod all turned under and we had fine ground to work. This we disked until we had a fine seed bed thoroughly pulverized. We then took the same plow and furrowed for the potatoes making the rows three and a half feet apart. We then dropped the potato seed about two feet apart and covered it with the harrow and we continued harrowing this every few days until the young potatoes were four to six inches high. After this we used the disk cultivator and the result was that we raised a good crop of Tubers.

Soil Treatment.

" 'We worked our entire crop the same way so far as possible keeping the disk cultivator in operation much of the time and always after a rain to prevent the ground from cracking open and the moisture from escaping. This dust mulch, stirring the soil and letting in the air does more than any other one thing in producing a crop in this locality. One acre handled this way equals two to three acres run over the slipshod way the most of our farmers have been doing their work.

Squash and Pumpkins.

" 'Our soil being very rich and productive, I advise to be careful and not get the corn too thick. Then plant a generous supply of squash and pumpkin seed, and I think the little pie pumpkin the best as they pollenize heavy and aside from making a yield of five to ten tons per acre and lots of good feed they serve another very important purpose of covering the ground, making a shade which both draws and preserves the moisture after the crop is laid by and can no longer be cultivated.

"In conclusion will say, my homestead is the Southwest Quarter of Section 22, Township 109 North, Range 79 West, Stanley County, South Dakota. I will not take the time or space here to itimize my crop of fifty-six varieties but will say that considering the season and other conditions I was well repaid for my efforts. At the going prices this little experimental sod crop of sixty acres figures in round numbers, $1,035.21.'

"My personal experiences in clay and gumbo soil have been largely in raising corn, potatoes, sugar beets, and mangels for cow feed and gardening.

Fall Plowing.

"I have prepared the ground with both fall plowing and spring plowing with good results in both cases, but as stated above prefer the fall plowing eight inches deep.

"We prepare our seed bed by thorough disking followed by the harrow.

Acreage Yields.

"I raised in 1907 and 1908, thirty bushels of corn to the acre on old ground and twenty bushels on sod. Potatoes, 125 to 150 bushels in 1907, and 100 bushels in 1908, the smaller return for 1908 being from the fact that part of the ground was sod plowed in the fall of 1907 and not rotted as much as it should have been to get best results.

"In 1907 the large cow beets produced at the rate of 1,200 bushels to the acre, in 1908 I planted sugar beets on a part of the same ground as that upon which I had the cow beets the year before with a result of a yield of about 1,000 bushels per acre.

Sugar Beets, Tomatoes.

"Our soil both on the riven bottoms as well as on the upland prairies will produce excellent crops of sugar beets and all other root crops. I have had excellent success with tomatoes during the past two years.

Campbell System.

"In closing I wish to express my high appreciation of, and respect for the work done, and his great services to the various questions of soil culture in the plains region of our great West, and I believe I express also the feelings of the delegates of this Congress when I refer to H. W. Campbell."

HAS THE FARMER ON THE NON-IRRIGATED LAND MADE GOOD?

By Walter H. Olin, Agronomist and Statistician of the Congress.

"I have been so busy and so much interested in assisting to secure and arrange the dry farming exhibits for this Congress that I have not had time to prepare a paper, and I don't know as I could stay by the text if I had. The exposition, however, demonstrates, better than I could tell you that some dry farmers at least have made good. I selected this title for my talk because about the time that Secretary Burns asked me if I wouldn't have a word to say to the Congress, rumors dire and fearful were coming up from certain sections of our western lands intimating that the farmers were not making good, and in some localities were thinking they would have to go back east. Ladies and gentlemen, that is just what you and I have got to stand up and face because we are members of this Dry Farming Congress, from those who are knocking upon us. Where there is one man that

Majority Are Succeeding.

fails, I want to say that my correspondence from North Dakota to California, and from Washington to Texas, indicates that there are nine hundred and ninety-nine men that are making good, and I say, 'Stand by your colors,' and I believe that we will be able to convince them in this section, as forty years ago they convinced them in my native state of California, that they could raise good crops, could make a living and obtain a bank account, if they used in a logical way the rainfall that providence gave to them. So much with reference to these reports. I wish to say that our good friends the newspaper writers have not belied us. I believe they are with us this time, and they want to disseminate the truths that have been advanced in this and preceding Congresses. I hope that the work of the statistical department of this Congress will be classified and made to gather in facts that will be incontrovertible, so that when reports come up from this section, or that section, that the secretary can find facts from the farmers themselves that will negafy the rumors coming to us.

Causes of Failure.

"Many and many new settlers came into our West from April 1, 1907, to April 1, 1908. Perhaps not twenty per cent. of these settlers were familiar with the conditions of soil or climate,—centainly many of them undertook to farm as they did back east where over thirty inches of rainfall is normal; and less than the normal amount came in this new country the first year of their immigration, and the normal in that section is from fourteen to seventeen inches per annum. A certain per cent. of these new settlers had never farmed before, and used unsafe methods to grow a crop. Our crop last year was a most trying one on account of an exceptionally dry winter, followed by a late, cool and dry spring, getting very little moisture before May first.

Small Percentage of Failures.

"In spite of the untoward season of 1908 I find that with the disadvantages of lack of experience, an unfavorable season and limited, or no capital to start with, less than ten per cent. of these new settlers under the most trying conditions failed to grow some kind of a crop.

"While I do not deny that some of these settlers may have to be helped to obtain seed for the new year,—a scattering, one here and there, may have 'gone back to his wife's people'—from whom let us trust he will not again stray,—but all with whom I can gain any correspondence whatever, who followed the fundamental principles of thorough tillage, as it has been so well presented at this, and preceding Congresses, grew feed and seed in not only this state but throughout our semi-arid West this past season.

Ninety Percent Successful.

"Your statistician has corresponded with farmers on the non-irrigated lands in every state, from North Dakota to California, from Washington to Texas, where farming is being practiced with a precipitation of less than twenty inches of rainfall, and the final conclusion is that over ninety per cent have made good in 1908 and previous years.

Causes of Failure.

"Of the remaining ten per cent., five per cent. had only settled that season and the other five per cent. will fail at farming as well as any other calling. Too many think just anybody can farm. Farming in the West calls for the highest class of intelligence and we need to discourage the settlers who do not and cannot mix brains with the soil.

"The fundamentals that the farmers who have 'made good' have used, I give in a synoptic form and the soundness of their logic taught to them by twenty-five to forty years of experience I leave to your better judgment.

Clay Sub-Soil.

"First: A soil adapted to farming with a clay sub-soil. Shun a sandy sub-soil, since it tends to leak moisture and makes it difficult to maintain a soil reservoir, where by capillary action, moisture reaches the plant as it has need. A sandy surface soil needs different treatment than a clayey or clay loam surface soil. Hence, do not treat all soils alike.

Soil Fertilization.

"Second: Have one cash money crop and make the major cropping of the farm, feed crops which give back at least seventy-five per cent. soil value of the crop fed to keep up fertility of the farm and maintain humus.

Live Stock

"Third: Keep live stock on the farm, the kind of live stock to be determined by the farm environment, market conditions and farm capital the owner can invest.

Deep Plowing.

"Fourth: Adoption of moisture conserving methods of tillage is vital and all important. Deep plowing in the average soil is the first great requisite.

Seed Adaptation.

"Fifth: Use acclimated and the most drouth resistant types of seed which can be made to fit into a purposeful, logical rotation for the farm. At least one lagume should be grown in all rotations chosen. I am too much of an enthusiast to here more than mention this subject, for time does not permit me to go into this subject as I want to.

Capital Necessary.

"Sixth: Some capital is absolutely essential for all settlers on western lands. In every instance of failure that I have been able to trace in the past four years, I find a dearth of capital to start with. We must frankly, fairly, candidly state that some capital here, as elsewhere, is required to build a home. I would hesitate to urge a man to bring his family to open up a homestead who did not have enough to stake him for at least twenty-four months. Instances are on record where men have worked for others and made good with little or no capital, but it is running too great a risk to encourage any man to trust to luck to pull his family through. Some capital then, we assert, is necessary to found a home.

Business Methods.

"Seventh: Back of soil, climate, seed, system and capital must be a resourceful, determined, intelligent farmer,—one who is willing to learn from his neighbors and adapt himself and his methods to his environment. Such a man is the one who seeks a well or utilizes flood water when he can to supplement the rain, and has a vegetable and fruit garden, which he can irrigate by a windmill or gasoline engine irrigation when rains do not come at proper times for best results. Such a man makes the dairy cow, the hen or the hog, bring in a regular income, incidentally manufacturing cheap foods into desired market products. Good business management often measures the difference between success and failure.

Education Necessary.

"A farmer who, in these days reads the experiences of his fellow farmers in other states, under similar conditions to his own, who keeps abreast of rural throught and action today, studies the why and how and when and never lets up until he wrests success from the struggle, is the one who wins out in the end."

FOREIGN INTEREST.

GOV. BROOKS (presiding): "We have present at this session many distinguished delegates from other countries, representatives from other nations and they have requested Senator McColl of Australia, to make a few remarks in their behalf, before the close of this convention, and I take this opportunity to introduce Senator McColl for that purpose."

SENATOR McCOLL: "Your Excellency, Ladies and Gentlemen: I have been requested by the foreign delegates who have been present at this Congress, that is, Senor L. Baeta-Neves, Brazil; J. A. Rosen, Department of Agriculture, Russia; Senor Romulo Escobar, Special Delegate from Mexico; Dr. William Macdonald, from the Transvaal; Mr. D. W. Warner and Mr. Fairfield, from Canada, as well as myself, to return to the Executive Committee of this Congress, and to you, Your Excellency, to the Mayor and all the Citizens of Cheyenne, our grateful thanks for the kind reception and most hospitable and gracious treatment we have received since we came to this city. We have come a long ways to attend this Congress; in fact, Dr. Macdonald and I have circled the globe. He went one way and I went the other and we met in Cheyenne. I do not know if in America ever before so many representatives of foreign nations have met, at any rate I suppose not in the West. Anyway, it took two 'Macks' to do it; Macdonald and McColl. Now it seems to me that such a meeting as this is prophetic. Here we have South Africa and Australia, meeting in the middle of America. Is that not prophetic? We are met on a pacific errand to try and subdue, not our enemies by engines of destruction, but our natural enemies for the benefit of humanity, and should it not be so, sir, that in the future that we will have these nations that are met in their humble representations such as ourselves shall never again meet in any other way, but shall join hands altogether in peace and amity working together for the good of humanity and for the world at large. I trust this movement will be persevered with and that it will go ahead.

International Movement.

"I do not know whether they have altered the name to 'International' or not, as was suggested, but at any rate, if not in name, it is in body and spirit, international, and I look forward to the day when we will have our meetings, not perhaps all in the United States, but in some other countries. I hope some day this great movement may have a congress meet in South Africa, another time in Brazil, another time in Canada, and at some future date, in Australia, where we will gladly welcome you. On behalf of my colleagues and myself, we return heartfelt thanks for your kind treatment and trust that God's blessings will rest on you all, on the city of Cheyenne, on the state of Wyoming, and the great republic of which you form a part; that it will go on and prosper and that we will ever afterward be engaged in these human measures of subduing the difficulties providence has set before us, and that we will have as long as the world endures lasting friendship between us all."

GOV. BROOKS (presiding): "The chair will be pleased to recognize any delegates from other states who may wish to improve this opportunity of saying a few words in befalf of dry farming."

MR. GEORGE, Montana: " I have only a rew remarks to make. I want to assure you that we appreciate the nice things on behalf of this Congress that our friend Senator McColl, of Australia, has said. We appreciate their visit more than any others that have visited us, for they came farther and made more sacrifices. I have entered into the purpose of this Congress to elevate it and I believe everyone representing my community is here for that purpose. I think that men who enter into a cause that appears hard and difficult, where sacrifice is to be made, grow stronger and more earnest than any other people, and I wish to thank these gentlemen who have come so far to this country for the nice things they say about us, and I hope they will see their way clear to come and be with us in the future. I believe the time will come when we all will be magnanimous enough to go to their country and have a congress. I believe a revolution is going on with the American people for the common good of all men. Any man who strives and works for a good cause, we should give him the right hand of fellowship, it doesn't matter what land or place he comes from. The community in which I live is made up of men from every state in the Union and from every nation. They are a check upon the others. We do not respect a man because he has made a million dollars; we respect him for what he represents in the community, for good in that community, both physically and morally. I wish to say a word at this time to the ladies. I am especially fond of the ladies. I have an elegant, beautiful wife at home and several children, and have been convinced for years that the wife was the master spirit; that she was the superior of man. I agree with the scientist who found that woman instead of being created from the rib of man, was first created; that instead of eating the forbidden fruit, she took some wax gum from the tree and chewed it, using the gum to make man and he has been sticking to her ever since.

"This lady who made the talk today,—Miss Frink,—I have never known a man to make the showing that this lady made in her first year of dry farming. She convinced me of the superiority of woman over man, from the results she got. I wish to say a word for your governor; he is very modest and wouldn't say it himself. I had the pleasure of attending a conference of governors at Washington for the purpose of conserving our great resources. Your governor spoke there to the men of the north, south, east and west. He told of the great resources of your state; he astonished the men of the south who wanted their canals and water-ways protected. He told them of the west and of the possibilities of it; he told them that by conserving the water here and irrigating the land and improving the country, it would protect the very things they were looking for. They came to know that the men of the west did not regard any lines between the north, south, east and west, but stood for a great country, and I do not think anything in the history of this country has done more for it than that conference. It brought us all close together for the common good, and I think every man should realize that you are fortunate in having a man in your state that will come out and show the country what you have and that you stand for a broad and expansive policy.

"Fellow citizens, I want you to realize and appreciate that we of Montana, your sister state, living on your border, and occupying a closer relation to you than any other state in the Union, appreciate the generous and kind treatment you have given us here, and we want you all to bring your wives and sweethearts and come to Billings next year. We have there a garden of Eden; we have a citizenship there that are looking to put this congress upon a higher plane, not for selfish reasons, but to spread the good news.

Work of the Congress.

"I believe firmly and honestly that this congress today is doing the greatest good at this time in America. I am convinced that the work of scientific farming is of as much benefit to the man who has irrigated land and land that will produce sufficient, with the rainfall, as to the man with land that is unirrigated. We have got to make the land produce ten times what it is producing today and we cannot do it without scientific thorough farming. The address tonight by Mr. Parsons of Colorado, interested me beyond anything I have heard; his thirty years of experience showed practical results. I tell you we do not want to get away from results.

"This oratory is a good thing, but it doesn't amount to anything if we do not advance; let us do something for posterity; let us leave the land which God Almighty has given us in better condition than that in which it was given. I want to apologize to you for intruding on you but by heart is in this subject and I deeply appreciate the education I have received from this convention. I thank you very much and hope to see you all at Billings, Montana, at the next Congress."

GOV. BROOKS (presiding): "We will all be there, Brother George. I will be glad to give a little time to any other delegate from any other state.

LIFE MEMBERSHIPS.

MR. PERSHING, Colorado: "I was just disappointed in one thing, that Prof. Olin didn't do like most ministers holding a meeting; that is, invite a lot of people to join. I speak for the life memberships."

MR. BAER, Nebraska: "When I hear speeches made, I would like to have the time taken up directly on the subject of dry farming. I have got a cold unfortunately and cannot give much of a talk, but I am enthusiastic on this dry farming question."

MEMBERSHIP CONTEST.

MR. GEORGE, Montana: "My friend Pershing reminds me of something. I want to offer a beautiful silver loving cup to the state or nation bringing the largest number of life memberships into the Congress. We will present to the state or country that during this year presents the most life memberships to this Congress, a silver loving cup. I offer this at this time."

GOV. BROOKS: "We have just received a telegram from one of the greatest rulers of the world. I confess I cannot read it, but I will have it translated in a few minutes. It is from one of the greatest men that our civilization has produced, President Diaz of Mexico. Unfortunately the representative of Mexico was called away this afternoon on account of the serious illness of his brother, who was stricken down with typhoid fever and he left hurriedly. We will now have the pleasure of listening to our Secretary, the one man above all others, to whom the success of this Congress is due, Secretary Burns."

ACCOMPLISHMENTS OF THE YEAR.

By John T. Burns, Secretary of the Board of Control.

MR. BURNS: "Mr. President, Ladies and Gentlemen of the Convention: The printed program says the Secretary is to make a report, but if any of you had been following the Secretary during the past ten or twelve days, during the time when he should have prepared a report, you could easily understand why there is no formal report.

Growth of the Movement.

"I believe that you all agree that there is now no organization in the west, in fact, I think I am safe in saying there is no organization in America holding a place of greater respect in the minds of the American people than does The Trans-Missouri Dry Farming Congress, or as it is hereafter to be called, The Dry Farming Congress. Less than three years ago this movement was given no serious attention. Men who talked about dry farming were considered land boomers. Men who advocated organization were met with ridicule on every side. Many attempts were made to organize this Congress, and when a convention was finally called by the commercial bodies of Denver, the newspapers, some of them, were inclined not to treat the matter seriously.

"Business men in the city of Denver did not give it a second thought. The commercial bodies treated it seriously only because they had taken hold of the subject and had called a convention. But, so far as looking forward to any practical results from the organization was concerned, Denver gave it no serious thought.

First Annual Sessions.

"You will all remember, those of you who attended the first Congress, that when that Congress closed, it had practically no organization. It has held several very interesting sessions, filled with not only instruction for the men present, but with deep meaning for the west, from the development standpoint. Yet, when that Congress closed and the last farewells were said and a dinner or two had put everyone in good nature, about all that was left was the memory of the Congress. Some newspapers gave liberal space to the discussions; a report was issued by the Denver Chamber of Commerce, but still there was not a lasting impression as a result of the work. Something was lacking. There was no machinery. No scheme of finance had been arranged; no method of management had been provided. In fact, from the time of the closing of the Congress until a very few weeks previous to the opening of the meeting at Salt Lake City, The Trans-Missouri Dry Farming Congress was merely a skeleton organization based upon good intentions. The president of the Congress, Fisher Harris, a man whom we all love, was taken very ill and was unable to give the matter his attention. There was no office and no central organization. To use a slang phrase—'nothing doing.' Until, in the face of most discouraging conditions, Mr. Harris decided to call the second Trans-Missouri Dry Farming Congress.

"At one time you will remember that a proposition was made that some other city be allowed to take the second Congress. It seemed there was no one looking after it; no one giving it any force; no one caring whether it was held or not, and so when Mr. Harris issued a call for the Congress, it was a very modest call, in black and white, and only a few thousand copies were sent out. And yet, you all remember that the second Congress was a most interesting event.

"More than six hundred delegates registered at that Congress, and more than one thousand people attended the sessions and listened to the addresses. The Armory hall in Salt Lake City was filled with enthusiastic dry farmers. There were some theorists present but no land men. There were many land agents, but not men who give their time and talent and effort to the exploitation of land propositions. That Congress closed however, in an entirely different condition, with a machine which you all know has been working constantly ever since.

Change of Public Sentiment.

"During the year dry farming has been placed on an entirely different basis before the people not only of the west but of the entire world. No longer do men scoff at the idea of possibility of growing crops without irrigation, and so deep is the respect for dry farming at this time that when a man does dare to make charges of an unpleasant nature, charges that are unfair and untrue, he is obliged to face a fusilade of protests from every earnest minded man who knows anything about dry farming.

"From one side of the country to the other; from coast to coast; from north to south the study of dry farming is now partially understood. It has assumed the proportions of an earnest, practical problem, which the American people have decided to solve through discussion, study and experiment until they have worked out the answer in an exact science by which men may develop these western states where irrigation is not feasible by making use of what little rainfall may be available.

A Fixed Science.

"I believe that dry farming will soon become a fixed science as the result of listening to, studying and reading the addresses of the men who attend the sessions of this Congress and tell their experiences. Dry farming, through the meetings of this Congress and the publications that have been issued; through the discussions and publication of various articles, both for and against dry farming, has become a living issue for the people of the world. It is a subject for general public discussion. It will be talked over at the annual sessions of this Congress until finally from all these addresses, theories, and reports, will be worked out a practical science that can no longer be questioned by skeptics. Much of this interest has been aroused and change of sentiment produced through the work of the Congress and its officers.

Press Bureau.

"The press bureau of the Congress has been a power in doing this work. Thousands of columns of newspaper and magazine articles have resulted from the publications of this Congress. Agricultural publications have begun to devote entire departments to this subject. The editorial tone of the agricultural publications is changing from ridicule to at least that of serious thoughtfulness. The implement publications are beginning to look forward to the time when dry farming is going to double the business of the manufacturers. The livestock publications now devote pages to dry farming subjects in connection with the development and continuance of the livestock business. Even the Associated Press has has begun to devote space to reports of dry farming results. The various press associations have taken up this work and to show you how this grows, and what it means to the people of the west as well as this Congress as an organization, I call to mind one syndicate including the

Cincinnati Post, Cleveland Press, Toledo News-Bee, Columbus Citizen, Covington Post, Des Moines News, Akron Press, San Francisco News, Los Angeles Record, Berkeley Independent, Seattle Star, Denver Express, Tacoma Times, Spokane Press, Portland News, Pueblo Sun, San Diego Sun, Sacramento Star, Fresno Tribune, Dallas Dispatch, Memphis Press, Evansville Press, Terre Haute Post, Oklahoma News, and several others, devotes space to frequent articles furnished by or through the press bureau of the Congress itself.

"The bulletins that have been issued have had much to do with this. It has been the effort of the Congress to publish bulletins from time to time covering various news items, and theoretical and practical papers furnished by members of the Congress. All of these articles have been passed upon by the Editorial Committee so that the Congress members have received nothing but reliable information. These bulletins have also been sent to newspapers throughout the west with permission to use, giving due credit to the Congress. A newspaper clipping book is kept by the Congress to record articles published, and estimating on a basis that we consider rational, that is, figuring that we secure one clipping to each ten articles published we have had more than 20,000 columns of actual space devoted to newspaper discussions of dry farming problems during the past year.

"We couldn't buy that space; on any basis whatsoever, because the publishers will not sell space in the editorial or news pages.

Statistical Bureau.

"Some months ago the Secretary sent out several thousand copies of a question blank, containing possibly seventy questions, designed to draw out information covering every point of interest in connection with dry farming development.

"Hundreds and hundreds of those blanks have been returned to the Congress and will be published in the Statistician's report. We are going to try to enlarge on that system so that we can have personal information from ten or fifteen thousand actual farmers in the west during the next year and from those statements compile statistical information for the members. These statements will be absolutely invaluable to every farmer.

"The membership during the past year has increased from nothing to 1,279, representing almost every state and territory and nine foreign nations. Of course, most of the membership is confined to the arid states where dry farming is the vital subject, but you will be surprised to look over the membership list and find there are several memberships in Illinois, for instance—I think about fifty,—even old Virginia has seven or eight people who are members of this Congress and who receive the publications. Day before yesterday the Secretary received three membership subscriptions from Russia.

International Movement.

"Our publications go to the agricultural departments of several nations and two of the foreign delegates tonight stated that they would take the trouble to translate the bulletins of this congress into their native language and to see that the agricultural departments sent them broadcast to their own farmers. I believe that this is only a beginning of an international movement along this line.

"The foreign consuls of the United States throughout the world have been requested to report on arid farm conditions directly to the office of this Congress, and eventually there will be a great international correspondence system by which members of this Congress will be enabled to study every item of interest pertaining to dry farming development throughout all the world.

"Foreign nations are taking hold of this study. The Mexican delegate stated this afternoon that it would give him great pleasure to hold a dry farming institute for Mexico and take up the work of this Congress in his own country, and he stated that there were hundreds of English speaking farmers in Mexico who should soon be receiving publications of this congress if he could bring it about.

Fake Advertising.

"We have always stood for honest newspaper work and the exploitation of facts only, and I believe the Congress would have continued along that line regardless of any resolution presented giving such instruction. It will stand for honest exploitation and honest writing by the men who attempt to describe conditions in a dry farming district, and I believe will openly resent any dishonest statements either favorable or unfavorable to dry farming; at least, that is the intent of the Executive Committee and its officers.

"The enemies of dry farming are beginning to understand The Dry Farming Congress is a very serious organization; that it intends to take its educational propoganda into all the world and to make dry farming as well known as is possible by means of printer's ink, or correspondence and through every system that may be considered reasonable and feasible by the Congress.

"I have a letter from a gentleman well known throughout the United States:

Publishers Interested.

" 'Cheyenne, Wyoming, February 25, 1909.

" 'Third Trans-Missouri Dry Farming Congress, Cheyenne, Wyoming.

" 'Gentlemen: As scientific editor of The American Boy, published in Detroit, Michigan, I wish to advise that the publishers of this magazine stand ready to assist in the promotion and study of dry farming to the extent of devoting a section of same each month with a view of interesting the young men of this country in the movement, if the sons of members of the Congress and the members themselves so desire it.

" 'Very truly yours,
" 'H. A. R. GRAY,

" 'Scientific Editor of The American Boy.'

"That is only one of many letters being received from publishers throughout the United States, and we have evidence all the time of an intense interest manifested among readers of the newspapers, magazines and agricultural publications, because editors are writing for copy from all over the United States. They want articles written along practical lines and not theoretical articles as to what dry farming may do. As an earmark of what Chicago publishers think of this movement we find that The Chicago Tribune, for instance, has sent a representative who has remained through all of the sessions of this third Congress. The Associated Press is taking thousands of words daily out of this Congress, and, I am informed, that Mr. Hearst has asked for a page magazine article on the results of this Congress. The Hearst syndicate has been taking articles daily during the past three weeks as a result of the agitation. I merely mention this to show to what extent the sentiment is growing as a result of the careful study given to this subject."

GOV. BROOKS (presiding): "Is there anything further on the Secretary's desk, Mr Burns?"

AMERICAN IRRIGATION FEDERATION.

MR. BURNS: "There is a letter from the American Irrigation Federation, which is as follows:

" 'Trans-Missouri Dry Farming Congress, Cheyenne, Wyoming.

" 'Gentlemen: Very sincere are my regrets at not being able to attend the Congress, but I assure you that I trust it will be none the less useful and instructive. While, as you know, I am connected more with irrigation

Experiment Stations.

than dry farming; for years I have advocated government experimental stations in the arid and semi-arid non-irrigable sections of the west.

Seed Breeding.

" 'New methods of farming tend to conserve moisture, and to benefit growing crops where rainfall is light, but I think that another element is of more importance. By selection of seed grains products may be developed that will withstand reasonable drouths, new forage plants be introduced, and old ones improved that will increase the pasturage capacity of the range. Mr. Luther Burbank has developed a spineless cactus that will prove a wonder worker in some parts of the west, and there are many other possible discoveries that will eventually wipe out the desert and fill the now arid wastes with homes.

Government Co-Operation.

" 'The federal government should aid in this work to a far more liberal extent than has heretofore been done. Experimental and demonstration farms should dot the entire west. As shown by Mr. Burbank, there are wonderful possibilities in the way of revolutionizing plant growth, and producing from the now useless plants of the desert, wealth at this time incalculable.

Reservoirs Prevent Floods.

" 'Our government still pours untold millions into river and harbor improvement, while small percentages of the sums thus spent, if placed in the west, will accomplish a much larger proportion of results. Large bodies of water stored in reservoirs at the heads of streams and an increasing acreage under irrigation, adds to evaporation and increases rainfall. This statement is so old that it is almost hackneyed but these developments serve another and less familiar purpose. They prevent floods and damage along the lower water courses; and assist navigation by producing a more regular flow.

Dry Farming Prevents Floods.

" 'These costs, and the costs of a few hundred or a thousand experimental farms is a mere bagatelle, and should be borne by the government. In stirring up the soil dry farmers permit the water to run into the earth that would otherwise pass off in floods, and their methods of conservation checks rapid evaporation and consequent violent precipitation; and a considerable portion of the water that passes into the earth through plowed fields, finds subterranean channels to springs and streams. Percollating waters move much more slowly than those upon the surface, thus dry farming incidently is useful to irrigation.

" 'It is a duty of the government to sustain the expenditures necessary to carry forward the work that I have outlined above, for by so doing there are created more homes for the homeless, and vast sums are added to American wealth.

" 'Practically useless lands are made to advance to ten, twenty, forty and sometimes hundreds of dollars per acre by the simple expedient of combining a few well known physical facts. A few dollars may be required to demonstrate these facts, and in what better use can we expend the federal revenues.

" 'Yours truly,
" 'G. L. SHUMWAY,
" 'Executive Chairman, American Irrigation Federation.' "

FAREWELL FROM RETIRING PRESIDENT.

GOV. BROOKS (presiding): "I would state before closing, that this convention has been undoubtedly of great use and benefit not only to this state, but to the entire western country, and that we hope the interesting proceedings as published later will be widely read throughout all sections of the world. We appreciate very greatly the attendance here at this convention and wish to express our appreciation and thanks to all who have prepared papers or delivered addresses during the three days' session. Despite the weather conditions, this has been a truly remarkable

Congress and the officers of the Congress appreciate the assistance and attendance of those outside of the state and on behalf of the state of Wyoming, I wish to express sincere thanks to all delegates who have traveled from long distances to attend this convention at this time."

MR. BURNS: "The telegram from President Porfirio Diaz of Mexico, explains that he is much interested in this movement, and regrets that he had no time to send more delegates than Mr. Escobar, who came here directly from Washington. The president expresses his confidence in the value of the movement generally."

A DELEGATE: "Three cheers for the men who have been back of this great convention."

The cheers were given with a will.

GOVERNOR BROOKS: "I now declare this convention adjourned sine die."

Statistician's Report.

VALUABLE ARRAY OF FACTS COMPILED BY WALTER H. OLIN, STATISTICIAN OF THE CONGRESS.

From information obtained from hundreds of statements sent to the statistical bureau of The Dry Farming Congress from farmers all over the West the following facts and figures are submitted.

In choosing facts for publication I have endeavored to give only those that yould be valuable to the new settler and give information into the hands of members of the Congress.

Space forbids giving full reports received in response to the Question Blanks and since we must winnow the amount of information received, your statistician has decided to arrange his report as follows:

I. Symposium of information received through Question Blanks which were filled out and returned.

II. Fundamental suggestions given at previous Congresses from the practical experience of Western farmers and demonstrated experiments by government officials.

III. Demonstrated facts from authoritative sources for new settlers on the non-irrigated lands of the West.

IV. The Congress exhibit.

V. Conclusions to be Drawn.

THE SYMPOSIUM.

(a) CALIFORNIA.

One of the most complete replies came from E. C. Driver, living in the Sacramento valley. Mr. Driver owns and operates 1,200 acres twelve miles northwest of Sacramento . He has no irrigation and has an average annual precipitation of less than fifteen inches, the moisture coming mostly in the winter months. His farming operations on the Dry Creek Stock Farm, as it is now known, began early in the sixties on a limited portion of that which the owner at present possesses. According to his present plans of operation as briefly given, 800 acres are used for cropping to grain and fruit, and 400 acres annually used for pasture purposes. Between 300 and 400 acres are given summer culture each year (this is included in the cropping area). This ground is plowed in the spring, given culture treatment through the summer and crop sown in the fall. The next fall, after crop is taken off, the ground is usually disked up and seeded to oats to be cut for hay purposes. Thus, the owner says he gets two crops with one plowing. As soon as crop is removed the field is pastured.

Precipitation.

Summer Fallow.

Cereals and Grapes.

Wheat, barley and oats are the grain crops, while grapes are considered the cash crop of the ranch; the most of the hay and grain being fed to live stock on the farm. The grapes are grown without irrigation very successfully. An average of thirty acres is maintained in grapes, with a usual yield from one hundred to one hundred and eighty tons of grapes per crop year, the grapes being worth about $15.00 per ton. In pruning, the vines are cut back to three to five buds per vine and five to six vines per root. Early in the spring vigorous cultivation begins. This conserves the moisture which has fallen through the rainy season, invigorates the grape vines, and keeps down the weeds. This cultivation is kept up as long as possible, without injury to the vines or setting fruit.

Live Stock Fattening.

The live stock of the ranch consists of 40 horses and mules, 50 shorthorn cattle, 50 hogs and 100 chickens. Forty acres of barley is sown each year for the hogs. This field of barley finishes the hogs for market. They are turned off about the middle of December each year, being sold, at a premium, for Christmas porkers.

Estimated Profits.

The running expenses of this ranch approximate $2,000 each year, and the annual proceeds are upwards of $8,000.

Mr. Driver is a believer in dry farming, having had forty years' successful experience in a region where the average annual evaporation is **40 inches,** while the precipitation scarcely ever reaches 15 inches. His ranch is not for sale, but his neighbors say it is worth not less than $60,000.

From Dr. E. W. Hilgard, of Berkeley University, whose work for farmers has won him international fame, we have the following interesting facts:

"California is the state in which dry farming has been longest practiced, although it is not so known under that designation. Our orchardists and vinyardists from the time of the beginning of fruit culture in California, have been careful to prepare the ground for summer, by thorough and continued tillage of at least five or six inches for the prevention of evaporation of the sub-soil, as well as for the better reception of any rains which may happen to come along during the dry season.

Soil Treatment.

Depletion of Humus.

"It is, therefore, not a new thing here, and our experience has been so lengthy as to already show the disadvantages which may result from a long cultivation of the practice, viz.: the depletion of the humus of the surface mulch by simple combustion under the dry heat of the summer. This results in soil becoming almost untillable and the fruit becoming small and unsalable, though still quite abundant. This has been especially noticeable in the older plantations in our Santa Clara valley, where the orchards and vineyards have suffered in this way. The remedy which has been successfully applied has been the use of green manuring, or stable manure, where available, in order to replace the humus, and the crop in this case has been promptly improved. Some negligent farmers who have left the weeds to grow, have not suffered in this way, for the simple reason that the weeds furnished annually quite a considerable green manure crop, and so prevented the depletion of the surface mulch.

Soil Fertilization.

"As you are doubtless aware, the use of the 'raw' manure is inadmissable in the arid region, because of its causing the soil to become too open, and spoiling it for the seed bed. The straw must first be made to decay by 'curing.' This fact has led, in the past, to an enormous waste of stable manure by burning, improvident farmers having found that the ashes do at least **some** good, if not as much as the rotted manure.

"This wasteful practice is rapidly disappearing, and both straw and straw manure are now being cured before incorporated into the soil which is almost always done in autumn. Its use on the surface, as done in the east, is wholly inadvisable.

Dry Farming in California.

"I merely mention these matters to you, although they are probably not new, to explain the reason why perhaps you do not find as much interest taken in the new agitation for dry farming in this state, as in other states. Forty years' experience already had by us has fixed so well, the dry farming practice that most farmers think it idle to attempt to improve upon it; although perhaps the use of the sub-soil packer might be advantageous. But, as with us the disk harrow and cultivator, heavily weighted, are very commonly used to prepare the summer mulch the object of the sub-soil packer is largely accomplished."

Soil Treatment.

[Your Statistican was born in California and his father was a vegetable gardener in Sacramento valley from 1861 to 1866. Even in that early day, moisture conserving methods were being successfully used, and California has certainly worked out methods well adapted to her climatic and soil conditions, which her farmers have demonstrated, are eminently successful, and made their state a pioneer in this so-called 'dry farmng' movement.]

(b) COLORADO.

R. R. Lucore, of Arriba, says: "Lands here have grown crops without irrigation for twenty-one years."

Precipitation—Acreage Yields.

Average rainfall, 15 inches. He has grown crops in connection with stock raising for many years; crops of corn, cane, millet, spring rye, barley, beans, potatoes and vegetables have been grown. Barley, rye and corn seldom, if ever, fail, and yield from a few bushels to 35, and barley as high as 45 bushels per acre. Potatoes are a pretty reliable crop, yielding sometimes as high as 100 bushels. Stock farming—growing and feeding up crops can be made a perfect success over all this plains country. No moisture should be allowed to get away in weed growth by the man who expects to make a success of grain farming.

Soil Treatment.

Ground should be plowed early—if possible fall plow—but too early seeding, probably avoided. Enough surface cultivation should be given to keep down weed growth. Keep seed bed in proper condition. "We must all study to improve; better methods of farming must be practiced. I feel that everyone should read Mr. Campbell's paper or other good literature on the subject.

"Foreigners with experience, proper tools and power, will farm dry land at $15 per acre profitably."

Soil Treatment—Seed.

C. S. Graves, of the same place, advises: "Use seed adapted to the region. Practice deep plowing. Disk soil before planting. Disk and harrow noon and night after plow. Harrow after each rain, plow only when the ground is moist. Disk ground as fast as grain is cut. Don't use too much seed."

Precipitation.

Cereals, Potatoes, Alfalfa.

James Brunker, living near Akron, states that he has farmed in western Nebraska for twelve years and eastern Colorado, sixteen years, where rainfall is less than twenty inches and land without irrigation. No irrigation is possible within the Akron district, yet crops have here, been successfully grown for twenty years. He reports crops of winter wheat, durum wheat, winter and spring rye, emmer and potatoes as being successfully raised. Mr. Brunker is succeeding with alfalfa, seeding it in rows on clean sod land. He seeds thick in the row on low land, and thin in the row on light, sandy soil; he cuts down the number of plants in the row, by thinning according to amount of moisture received. Rows are fifteen and thirty-two inches apart. Last season he seeded May 7, 1908, and September 11, he had alfalfa twenty-two inches high. He disks his alfalfa each spring while the ground is moist.

Corn and Cane.

Soil Treatment.

Campbell System.

W. J. Pettis, of Bennett, says that his district has about thirty thousand acres under cultivation—all above the ditch. There have been eight crops taken off from the oldest plowed fields. Corn and cane he considers the most successful crops. The year 1908 was the driest one known for many years. Farmers are just beginning to summer culture land for the next year's crop. Deep plowing stands the drouth best. He says: "I break sod four inches deep and plow two inches deeper each year. The best suggestion I can give is to follow the Campbell System; I am going to do so from now on."

Estimated Income.

George W. Moore, of Dover, has successfully grown winter wheat, durum wheat, oats, fodder grasses, sugar beets and potatoes. One hundred thousand acres of non-irrigable land is now being farmed with 800,000 possible of cultivation. He estimates that with land selling at $15 per acre, farmers near Dover can still make on that say 20 per cent. The season, last year, was an exceedingly dry one, yet all made **"feed and keep."**

Acreage Yields.

Elbridge Green, of Dover, reports small grain yields from six to 30 bushels per acre, corn eight to 25 bushels and alfalfa as doing reasonably well there. He reports having trouble to get his ground plowed deep enough to suit him. He is an interested and successful dry farmer, seventy-five years of age.

Acreage Results.

Miss Marguerite Frink, of Fort Lupton, this last year (1908), raised 270 acres of sod corn, ten acres of hubbard squash, and ten acres of watermelons. While two severe hail storms passed over her ranch,

Soil Treatment.

she immediately followed the hailing of the crop with a thorough cultivation and while the squash and melons were set back too far by the storm, to be of marketable value, she did get a large quantity of feed and the corn averaged 28 bushels per acre. She reports 290 acres now in winter wheat in good condition.

Conservation of Moisture.

This successful woman homesteader says that the difference between the farmer under the ditch and the successful dry farmer, is that one stores the water in reservoirs, and the other in the ground. She explains the reason why some succeed and others fail at dry farming in the address she gave at Cheyenne, published in the proceedings of The Third Dry Farming Congress.

Estimated Income.

J. K. Darby, of Grover, reports that dry farm land in his locality worth $15.00 can be worked at a profit of 100 per cent. His crop yields were as follows:

Acreage Yields.

Wheat, 10 to 45 bushels per acre; rye, four to 15 bushels per acre; emmer, 12 to 25 bushels per acre; oats, 20 to 35 bushels per acre; barley, 12 to 18 bushels per acre; corn, 12 to 30 bushels per acre; fodder grasses, one to two tons per acre; mangels, 10 to 16 tons per acre; rutabagas, do well; potatoes, 40 to 60 sacks per acre.

Deep Plowing.

D. W. Scott, of Haxtun, says he has farmed in his section 21 years. He reports growing wheat, corn, oats, emmer, millet, cane and potatoes quite successfully. He has found it wise to harrow according to the wind for Haxtun soil is sandy and the wind blows it, if surface is too fine. He believes the greatest thing for his section is deep plowing.

Poultry Raising and Dairy Products.

Mrs. S. S. Worley, of Holyoke, shows how the hen works to "help out" on the farm. She started in the spring with 80 B. P. Rock hens. She raised 325 chicks, supplied her table with eggs and poultry meat, and after accounting for what grain she had to feed her chickens, besides what they picked up and thereby saved on the farm, she had $200 to her credit and 90 pullets for next year's operation. She sold 500 dozen eggs during the season. She also cleared $110 from three dairy cows.

Forage Crops.

Henry Swan of Hugo, for a number of years has successfully grown wheat, oats, corn and feed or forage crops. In 1907 he husked 40 bushels to the acre of sound, marketable corn. He has never failed to grow seed and feed for his farm.

Estimated Profits.

Milo McGowan of Limon, says that dry farming has been tested in his district for 12 years. His experience leads him to say that three years out of five, non-irrigated lands in his district can be made to net the owner $5 per acre.

Poultry Raising and Dairy Products.

He advises the new settler to first, buy some milch cows and poultry, and let extensive farming alone, if his means are limited. Figure on hard times, for this is the history of all new countries. Do not farm too much land, but farm it right.

Soil Treatment.

Practice summer culture; use the harrow and sub-surface packer. Plow deep, sow early, pack soil as fast as plowed, do not give it an opportunity to dry out. Best crop for soil is corn or cane. Better buy a cow than to pay for steam plowing.

Precipitation.

E R. Parsons of Parker, states that his farm record shows, on a ten year average, 14 7-8 inches rainfall per annum. The major portion of this precipitation occurs in May, April, August, July, October, in order of months named.

Average Yields.

Mr. Parsons has been farming his present ranch since 1886—23 years. The following yields are from ranch records. Minimum yields were obtained dry years as '93, '94, '96 and 1898, maximum yields on ordinary years: Winter wheat, 20 to 40 bushels; spring wheat, 15 to 30 bushels, Durum wheat, 10 to 30 bushels; winter rye, 25 to 45 bushels; oats, 10 to 50 bushels; bald barley, 20 to 30 bushels; corn, 20 to 40 bushels; alfalfa, 3-4 to 1 1-2 tons.

Dry Land Horticulture.

Horticulture is successful. Mr. Parson's orchards, in bearing, bring him from $100 to $150 per acre. This successful ranch-man speaking of his orchard, says: "My orchard depends upon cultivation, no part of it irrigated. My trees are dark and glossy, showing the effects of cultivation. My orchard is a quarter of a mile long and down hill, and a hundred ditches could never seep through my solid clay. I have been gaining moisture in my orchard for a long time by cultivation. It now

Depth of Moisture.

reaches a depth of 15 to 20 feet, but on the same kind of land, where it is still sod, there is no moisture at any depth. Professors Jardine and Allway examined my orchard, and Prof, Allway, took borings all over it with his ground augur. These gentlemen can both certify that my orchard is a true product of dry farming. I am thinning out my apple trees to 40 feet.

Apple Orchard.

"A square of 40 feet with a precipitation of 14 inches gives us about 60 tons of water a year to the tree. I have offered $1,000 to anybody who will show that my trees are grown in seepage, as this orchard has been reported to be growing, by certain parties.

Deep Plowing.

"My experience both in South Africa and Colorado lead me to say that deep plowing—10 to 15 inches—is safest. The new dry farm systems are all weak in plowing. The only way to get into the 30 and 40 bushel yield, per acre, is to plow **deep.** Plant alfalfa if only for home use. All it needs is deep soil.

Summer Fallow.

"Fallow between every crop; if only for a month or two, **fallow.** You can raise your own fruit easier than crops. Fear nothing, get right out and do things. The past season (1908), has been one of the driest, yet experienced, but deep plowing, pulled us through in fine shape. Everybody else dried out or partially dried out in the district. The county is importing $20,000 worth of hay. We have a plenty, and a foot of snow all over the ground, insuring moisture for the next year's crop.

Seeding Thin.

"The amount of seed per acre is very important for the beginner to know. I use 10 pounds of alfalfa, rye, 25 pounds; winter wheat, 30 pounds; spring wheat, 40 pounds, and corn, about 5 pounds per acre."

(c) IDAHO.

Summer Fallow.

F. W. Boehme, of Geneva, says he has been farming in his district for 14 years. He has been cropping annually, but says he will now try the summer culture plan. His altitude is 7,000 feet. Most of the moisture comes in winter. The following crops are being raised without irrigation, acreage yields being given:

Acreage Yields.

Spring wheat, 16 to 25 bushels; Durum wheat, few to 24 bushels; rye—winter and spring, 12 to 18 bushels; emmer (speltz), a few to 62 bushels; oats, 18 to 53 bushels; barley, 18 to 45 bushels; fodder grasses.

raised with good results; brome grass, raised with good results; alfalfa, 1½ to 3 tons per acre.

Alfalfa.

He says: "We have most excellent results with the Turkestan alfalfa. We have 16 sections in my district irrigated, four sections cultivated without irrigation and five times that amount can be. My suggestions to the new settlers are:

Soil Treatment

"(1) Deep and good plowing—narrow furrows.
"(2) Good, well cultivated seed bed.
"(3) Extra recleaned seed—use 35 to 60 pounds per acre.
"(4) Use small amounts of seed with press drill.

"One thing the Congress should surely do—give us information regarding artesian wells and water supply for home use on the dry farm."

Dry Land Acreage.

M. M. Hammond, of Ashton, reports 350,000 acres in his section under irrigation, 30,000 acres now farmed "above the ditch" with 100,000 acres which should be under cultivation. Altitude 5,000 feet. Has had six years experience here, grown crops of winter and spring wheat, oats, barley and potatoes. The latter yield from 50 to 200 bushels per acre. He says he has obtained his best results where he has plowed good and deep in the fall, harrowed and leveled the ground until it was well settled and the surface well pulverized. It can then receive and retain water well.

Diversified Crops.

Soil Treatment.

Summer Fallow.

He says: "We get one-third more crop when we summer culture land than we do when we crop annually. My section had a hot, dry summer last season, (1908) which cut down our yields of grain, but my 500 acres averaged me 30 bushels per acree. Land five years ago selling at 10 per acre, now brings $30 to $50. I can net $5 per acre on the average one year with another."

Acreage Yields.

Dry Land Acreage.

F. C. Bowman, of Idaho Falls, says: "While Fremont and Bingham counties have 130,000 acres under irrigation, 30,000 acres are being cultivated above the ditch and 500,000 acres can thus be farmed. Most of the moisture comes from March to July 1st. In the north end of this valley, farmers practice annual cropping, but in the south end of the valley, alternate cropping. Winter wheat has been successfully grown for three years. Non-irrigated land in this district is now selling from $10 to $50 per acre."

Gustave Peterset, of Raymond, says that "dry farming" in his section has been carried on very satisfactorily for about six years.

Summer Fallow.

He gives his land summer culture every three years. He says 1908 was an extra dry season and somewhat frosty, (altitude 5,000 feet), yet

Acreage Results.

Gold Coin winter wheat gave over 30 bushels per acre; 90 day spring wheat, 16 bushels; emmer, 25 bushels; potatoes, 200 bushels per acre; while a considerable amount of vegetables were grown in the district. Rye, oats, barley, stock beets and alfalfa are also grown. Mangles often yield from 20 to 40 tons, and alfalfa two to five tons per acre.

(d) KANSAS.

H. M. Poe, of Norton, reports crop yields per acre, for his district, as follows: "Winter wheat, 6 to 42 bushels; winter rye, 10 to 35 bushels; emmer (speltz), 5 to 40 bushels; oats, 10 to 60 bushels; barley, 3 to 50 bushels; corn, 7 to 70 bushels; Alfalfa, one to four tons; fodder grasses, one to eight tons; sugar beets, three to 11 tons; potatoes, one to four tons."

Estimated Profits.

He says farmers in his district are making a clear profit of 20 per cent on their non-irrigated lands. Altitude 2200 feet.

Diversified Crop.

W. B. Canfield, of Warren—altitude 3,600 feet—says he has farmed there for 20 years, is satisfied he can get a living, year by year, or he would move out—no irrigation. General crops of wheat, barley, corn, cane and millet are grown.

Alfalfa.

Dr. D. W. Workman, of Ashland, says they are raising good general crops and adds alfalfa to the crops Mr. Canfield names. He seeds alfalfa in rows and makes it a cultivated crop. Production of alfalfa seed bids fair to become their most remunerative crop.

(e) MONTANA.

Soil Treatment—Depth of Moisture.

S. B. Wright, of Harrison, says dry farming has been practiced in his section of Montana for four years. To quote: "We practice summer fallowing. We plow at least nine inches deep. We harrow all we can. We use an extra horse hitched beside the plow-team, drawing one section of a harrow, thus harrowing the ground four and five times This plan conserves moisture and puts the ground in good seed bed condition. In our cultivated fields we find that moisture has extended down in the ground deeper than we dig for fence posts Wheat and rye are our staple crops"

Precipitation.

F. M. Lohr, of Glasgow, says: "Our rainfall is about 13 inches. Our most rainy months are May and June. We have been dry farming for about six years, but it is done wihout any system.

Diversified Crops.

"We are growing oats, flax, wheat, potatoes and alfalfa. These crops are, and can be, grown successfully on our non-irrigated lands. If the land is handled right, it will yield, without question, a profitable return."

Precipitation.

W. B. Walker of Glendive, (Dawson county), says that dry farming has only been tested three years in his section. Altitude 2100 feet. Average precipitation 15.34 inches per year. Most of the rainfall comes from March 1st to September 1st. Five thousand acres under cultivation with a possibility of 500,000 acres in that region without irrigation.

Diversified Crops

Oats, flax, wheat, potatoes and alfalfa are now being successfully grown. He made a total failure this past season, (1908) on sixty-day oats and Durum wheat. Has 115 acres of winter wheat seeded.

Summer Fallow.

George B. Tripp of Garneill, reports 50,000 acres of non-irrigated land in that region being cultivated. Crops on spring plowed land were a failure this past season, while crops on summer cultivated land were fairly successful. He thinks spring grain in his region should be sown as early as possible.

Diversified Crops.

Horticulture is generally a success, with plenty of cultivation. Altitude 4500 feet. Wheat, oats, barley, vegetables and alfalfa are successfully grown. Four crops of alfalfa per season.

Jas. M. Cropp, of Lewistown, states that dry farming has been practiced in that district for seven years. Rainfall 17 inches per annum. Winter wheat, oats and potatoes, are the crops which are more generally grown. Alfalfa does well when once thoroughly started. Four crops per year.

Acreage Yields.

Dr. W. X. Sudduth reports, for the Billings district, as follows:

"One hundred thousand acres under irrigation, 25,000 acres being farmed without irrigation with a possibility of 500,000 acres. Rainfall 14 to 16 inches. Altogether, dry farming has been tested in this country for 25 years. Alfalfa is successfully grown here for both seed and hay. Crops grown and acreage yields obtained are as follows: Winter wheat, 30 to 46 bushels; spring wheat, 15 to 27 bushels; Durum wheat, 14 to

38 bushels; winter rye, 12 to 22 bushels; emmer, 30 to 35 bushels; oats, 30 to 80 bushels; barley, 20 to 46 bushels; corn, 30 to 75 bushels; Canadian field peas, three o five tons; alfalfa, 11-2 to 2 1-2 tons; sugar beets, 10 to 15 tons; potatoes, 75 to 150 bushels.

"Beyond doubt, dry farming has passed the experimental stage and is now a commercial proposition. Altitude of land farmed, varies from 3,000 to 4,000 feet."

Diversified Crops.

Drape Bros., living at Red Lodge, state that a large area in that region could be cultivated which cannot be irrigated. Some of these lands have been profitably cultivated for three years. Turkey Red wheat, fall sown, and Durum wheat, spring sown, have given good results, as well as barley and oats. Alfalfa gives one, and often two good crops where, under irrigation, same region, it gives three and sometimes four crops. Potatoes have recently "made good" and fruit culture is being introduced. Altitude 5548 feet. Many of the farmers operate both **under** and **above** the **ditch.**

Dry Land Acreage—Precipitation.

John B. Clark, living at Moore, states that his country has 100,000 acres under irrigation, 75,000 being farmed without irrigation and one million acres possible for dry farming methods. Rainfall 18 inches, heaviest rainfall in June and July. Dry farming has been practiced in this region for six years. Crops of wheat, oats, barley and potatoes are staple, while clover, timothy and alfalfa are also being grown.

Acreage Yields.

For eight years, oats have averaged 50 bushels per acre. Wheat for three years, averaged 30 bushels per acre. Mr. Clark broke up 240 acres of prairie sod, summer tilled it, put it into Turkey Red wheat in the fall of 1907. Although the summer of 1908 was the driest one known for years, his wheat yielded him 22½ bushels per acre.

Fruit and Shade Trees.

A number of farmers have been putting out fruit and shade trees in the last few years. Altitude 4,300 feet. When summer tilled, they are doing well. Mr. Clark has an orchard of 100 apple trees, which have been set out three years and are now fine, healthy looking trees. Speaking from experience, Mr. Clark says:

Soil Treatment.

"Good deep plowing is best; practice keeping well up to the plow with the harrow. Harrow after every heavy rain, until seeding time, early in September, with us. Use about 40 pounds of wheat to the acre, seeded with good drill. Harrow once or twice in the spring and we are

Acreage Yields.

sure of 30 to 40 bushels to the acre. Some, here, are disking their stubble early in the spring to conserve moisture and kill weeds."

Acreage Yields.

Matt. Wannebo, of Natal, says: "I put my crop in before I brought my family here in 1900. It was a partial failure but averaged 25 bushels of cereals. In 1907 I raised 2,900 bushels of oats and barley from 75 acres. The year 1908 was very dry and I only tried to crop 30 acres. I averaged 30 bushels to the acre. I have $2,000 worth of good horses and cattle. Timothy produces from one and one-half to three tons to the acre."

Acreage Yields.

J. H. Hoseman, of Moore, Fergus county, has operated on a dry farm there since 1887 and has 400 acres in winter wheat. He intends to give his attention to that crop. He reports average yields as follows: 1906, 2,480 bushels of winter wheat, from 90 acres, an average of 27.55 bushels per acre; 1907, 130 acres gave 5,850 bushels, or 45 bushels to the acre; 1908, 3,410 bushels, from 130 acres, or 26.24 bushels per acre. This gives an average of 33 bushels per acre for three years.

Soil Treatment.

He says: "I believe in commencing to summer fallow about June 15th, working the ground at once after plowing, later disking and harrowing again. Winter wheat does better here if planted from Sepember 1st to 20th."

Acreage Yields.

D. C. Walker, Jone's Postoffice, says: "In any ordinary season a farmer in the Judith Basin is sure of crops of small grains, potatoes and other vegetables do well. Fruits, such as raspberries and strawberries are profitable. In 1907, 25 acres of winter wheat gave me an average of 45 bushels, but in 1908, there was a most severe drouth and the average was not heavy. However my crop was by no means a failure."

Cash Capital needed.

George H. Shepard, Lewiston: "When I came to the Judith Basin I had two ponies, a saddle and four dollars in money. I worked two years for wages and then began farming for myself. In 1907, 25 acres of oats threshed 1,968 bushels. Spring wheat gave 40½ bushels to the acre! A man locating here should have $1,500 to $2,000 cash capital, and with this he would find as good opportunities as in any farming district in the country."

(f) NEBRASKA.

Summer Fallow.

William Martens, of Chadron, states that there are in his district, 500 acres irrigated and three times that amount being farmed without irrigation. He is the only one in his neighborhood, he states, who is attempting to follow the modern dry farming methods. He practices summer culture and often harvests more than double the average yield of his district. He has been following this plan seven years.

Acreage Yields.

Some seasons cuts 2½ tons of alfalfa per acre. Winter grain for the district, runs from 12 o 25 bushels. Spring grain 12 to 40 bushels. Oats sometimes as high as 75 bushels per acre. Potatoes yield from 50 to 100 bushels per acre.

Poor Dry Farming.

E. B. Quible, of Merriman, reports very little crop growing in his region, the ranchmen being largely engaged in stock raising. They have a very sandy soil, only plow three to six inches deep and crop annually.

E. A. Bigelow, of Harrison, says he has farmed there for 20 years. He states he crops annually, plows but four inches deep and harrows two to three times. His crops are small grain, corn, potatoes and alfalfa.

Precipitation—Acreage Yields.

J. F. Young, secretary of the Farmers' Institute at Cody, informs us that his region is farming 100,000 acres without irrigation with an annual precipitation of but 12 inches. Crops of corn, oats, barley and potatoes are being grown successfully. Grain crops yield from eight to 40 bushels and potatoes 20 to 100 bushels per acre.

Dairying—Stock Raising.

Erastus Hobbs, at Brule, says he has farmed without irrigation in that section for 20 years. By combining dairying and stock raising with crop growing he feels that Brule farmers are certain of success.

Soil Fertilization.

He finds he can use manure as a top dressing to his small grain ground to great advantage, when applied with a manure spreader. Wheat, corn, emmer and potatoes are the staple crops.

Dry Land Acreage.

Jno. W. Roberts, Hay Springs, reports for his region, 2,000 acres under irrigation and 200,000 acres being farmed without irrigation, with a possibility of 800,000 acres to be thus farmed. He has been in that section for 20 years and no longer considers dry farming an experiment, but a decided success. Fruit culture just being started in that section. He says everything which can be grown at that altitude (3600 feet), grows quite successfully.

Crop Rotation—Soil Treatment.

Best results come with a good crop rotation and modern dry farm methods. Deep cultivation, a thorough top dressing, diligent use of the harrow following deep plowing, he considers essentials for Sheridan county farmers to put in practice. Dry farming has raised his country

Results of Methodical Work.

from a section having no standing in the state, as a crop raising section, to **first** in potatoes, **first** in spring wheat, second in emmer (speltz), fourth in cattle and eleventh in oats, according to Bulletin No. 14, from Bureau of Labor and Statistics of the Nebraska Agricultural College.

(g) NEW MEXICO.

Precipitation.

J. P. Dunlavy, living at Mountainair, writes as follows: "Our annual rainfall i supwards of 16 inches, coming largely in our growing season.

System Not New.

"Dry farming has really been practiced here for over 100 years, Even with poor teams, inferior implements, bad seeds and little tillage, corn, wheat, oats, cane, millet potatoes and all kinds of vegetables have been successfully grown for over a century. I have been farming here for three years and find the more advanced methods of scientific farming bring results.

Acreage Results.

"While a good deal depends upon the kind of farmer, we have farmers on government land, who are actually making from $36 to $150 per acre from corn and potatoes, as well as other crops.

Causes of Failure.

"I find from experience here, that if we plow deep, cultivate thoroughly, harrow as often as possible, enter into the business of farming and farm as if we were sure of results, believing that no such a thing as failure of crops comes to the conservatively industrious, we will succeed. These kind of people actually "made good" here last year, while the timid and pessimistic **failed."**

Campbell's System.

Robert Humphrey, of Clovis, states that he has farmed about two years in that region, but thinks when the farmers of his section fully adopt the scientific methods of dry farming, especially Campbell's soil culture methods, all will succeed. He says:

Diversified Crops.

"Indian and kaffir corn, milo maize, millet, sweet and Irish potatoes and all kinds of vegetables seem to do well there. Some few persons are growing fruit, but under disadvantages. The country is new and but few persons really came prepared to farm. They came simply to take advantage of Uncle Sam's offer of 160 acres of land. My experience and observation leads me to say, I think we can raise almost anything we want to here, when we get our soil in a good state of cultivation.

Soil Treatment.

"I break sod three inches deep and try to go down two to three inches deeper each successive plowing until I get down 10 to 12 inches deep."

Precipitation.

Willard Belknap, of Nara Visa, states that his county is farming 50,000 acres of non-irrigated land with a possibility of ten times of that area. The precipitation is about 18 inches, most of it coming from April 15th to October 1st.

Sod Crops.

The country is newly settled, many sod crops being grown. He has seen sod crops yield 35 bushels of corn and 75 bushels of potatoes per acre.

Soil Treatment.

"I would say deep plowing, harrowing after each heavy rain, and using the same skill and care in farming, that a jeweler uses in making a watch, will bring success in farming in my section."

Acreage Results.

"N. F. Miller, living near Tucumcari, broke his ground in February, 1908, doing all the work himself. He plowed 10 inches to begin with, and harrowed it well. He harvested 200 bushels of corn from eight acres and two tons per acre of kafir corn from five acres. His milo maize field of 10 acres gave him two tons per acre. From six acres, in turnips, he harvested 75 bushels. He also had 3½ acres in watermelons, from which he picked 1860 melons, netting him $423. From 11 acres of cane he got 69 gallons of syrup besides one ton per acre of forage and seed. He also had good results with pumpkins, beans, millet and stock peas.

J. T. Cody, of Logan, states that he settled there in the spring of 1908. At the start there was a very dry spell lasting 90 days and no good growing weather until after July 15th. This was a discouragement to begin with, but he put in his crop and after the rain came, he was surprised to see the rapid growth. Although 1908 is recorded as one of the **driest** years for that section Mr. Cody secured a fair crop.

DROUTH RESOLUTIONS FROM NEW MEXICO FARMERS.

At the Nara Visa fair last fall, after listening to accounts of a scourge of drouth in eastern states, read by U. S. Commissioner Belknap, the following resolution was adopted and given to the Associated Press:

"We, the homesteaders and settlers of the Nara Visa country assembled at the second annual fair at Nara Visa, New Mexico, having been informed of the extreme drouth that prevails in many portions of the northeast, to-wit, in the states of Pennsylvania, Ohio, Indiana, Michigan, Illinois and Kentucky, and being informed that in many parts of said states crops are an entire failure and that the farmers are being compelled to feed their stock at this season of the year and that the wells, springs and streams have gone dry and that water has become a luxury to be afforded only by the well-to-do, and that in many sections of said states the forests and pastures are being consumed by fire.

"Now, therefore, we, the homesteaders and settlers of the Nara Visa county, vote our most heartfelt sympathy for the drouth stricken farmers of said states and extend to them a cordial invitation to come and join us in the garden spot of the southwest."

(h) NEVADA.

Precipitation.

John K. Cozier, living near Wells, says: "The rainfall here is about 14 inches and comes mostly during the spring months. In this region is an almost unlimited amount of good sage brush land and the conditions for dry farming appear to me as good as in Utah where they are making a success of it.

Summer Fallow.

There are almost no dry farmers in this country. I summer fallow alternate years. Potatoes and vegetables grow easily and cannot be excelled for quality. Small grain and alfalfa do well."

(i) NORTH DAKOTA.

Summer Fallow.

R. K. Thompson, living at Bottineau, writes: "Our altitude is 1,600 feet. Average rainfall 20 inches. No scientific farming is carried on in this country, but all are operating under ordinary conditions without irrigation. Where summer fallow is practiced much larger and better crops are obtained. If possible, send report of this Congress to help us."

Acreage Yields.

Bernard Glaspell, of Jamestown, says: "Dry farming has not been tested in this country long enough to tell much about it. The farmers here are just beginning to try alfalfa. I have grown the following crops here: spring wheat, 6 to 30 bushels; oats, 15 to 60 bushels; barley, 10 to 50 bushels; potatoes, 75 to 400 bushels; brome grass, one to three tons

Fruit Trees.

I planted 100 fruit trees last spring (1908), kept them cultivated all the time and, in spite of trying conditions and the dry weather, they made a good growth. My present method of cropping is not satisfactory. I expect to practice summer culture hereafter.

Soil Treatment.

"I had a field of eight acres this past year which I plowed—10 inches deep, fall of 1907. I double disked it in spring early, harrowing just before seeding, I sowed seven acres to millet and planted the other acre in potatoes. I harrowed the potatoes until they were six inches high and cultivated after each rain. The season was a most unfavorable one.

Acreage Results.

The millet yielded four tons per acre, and potatoes 220 bushels per acre. In July we had dry weather and hot, dry winds burning the grain to the ground. About the last of July, rains came and we harvested a small crop of grain. I am convinced, from results on my eight acres, that better farming **pays**, here as elsewhere."

(j) SOUTH DAKOTA.

Precipitation.

G. H. Carroll, living near Miller, reports annual rainfall of 20 inches, much of it falling from April to September. Two hundred and fifty thousand acres are now under cultivation in his country without irrigation and four times that amount of land could be cultivated. He reports the usual grain crops and potatoes as being successfully grown. He has farmed there for 25 years. His methods of farming he thus explains:

Soil Treatment.

"My rule is to plow as deep as I can, in the spring, with gang plows. I work that down—harrow, disk, work with any kind of a machine that will settle and pack the earth.

Dry Farm Corn.

"I plant corn in check rows, sometimes drill it. I use a Hallock weeder, and cultivate three times and use a double row cultivator, as a man can thus do more work. I cut corn with a binder just as corn hardens. I feed it to cattle and hogs in big mangers. Disk corn ground in spring, harrow and drill in wheat, oats or barley. I have never owned any of the scientific implements for dry farming. I like my own plans very well and will practice them until I find something better."

William M. O'Banion, of Buffalo Gap, states that his section of the state is growing crops of oats, barley, corn and potatoes and a few farmers are growing alfalfa, obtaining two light crops per season. He says they all need more interest and energy in the methods used at present.

Precipitation.

W F Hall, who has lived near Rapid City for 23 years, says the annual rainfall is 18 inches for his region. Farmers are growing alfalfa with success cutting two to four tons per acre. Other acreage yields given are:

Acreage Yields.

Spring wheat, eight to 37½ bushels; winter wheat, 10 to 35 bushels;

oats, 15 to 70 bushels; corn, seven to 50 bushels; potatoes, 25 to 300 bushels.

Fruit.

He says he believes the past methods of crop growing are being greatly improved. He has watched two certain orchards for many years, that are being tilled under dry farming methods with splendid results.

Fruit.

H. J. McCain, of same region, says that within six miles of Rapid City is the second largest orchard in the State, covering 100 acres. This orchard produced 1,000 barrels of apples in 1908. Chris. Thompson is the owner.

Alfalfa and Fodder.

He states that alfalfa has been grown in that locality for 10 years, while brome and native wheat grasses are also successfully grown for pasture and meadow purposes. He considers flax, cane and broom corn, good and successful crops grown in addition to those named by Mr. Hall.

Better Methods.

He is intensely interested in the subject of improved scientific methods of dry farming and feels that the future success of the semi-arid districts of the West and Northwest depend upon their adoption, especially where it is impossible to irrigate. Anything or any method which tends to conserve the moisture in the ground, he thinks, should be encouraged and adopted.

Precipitation.

Chas. A. Jensen, of the Bellefourche U. S. Station demonstration farm, states that the records, kept for ten years, show an annual rainfall for that section of 18 inches—major portion falling from April to June. He reports some farming in that region for 20 years, but suggests that better methods must be practiced for best results.

Soil Treatment.

He advises farmers to fall plow, as deep as possible, seeding winter grain more generally; to practice early spring seeding; harrow after rains; have a crop rotation for the farm, conserve and add more organic matter to the heavy clay soils in that locality. The demonstration farm, for crop year 1908, gave the following general acreage results:

Winter wheat, 10 to 30 bushels; durum wheat, 10 to 30 bushels; oats, 20 to 50 bushels; barley, 48 bushels; corn, 5 to 10 bushels; western wheat grass, one-half to two tons.

(k) TEXAS.

Homesteader's Experience.

F. S. Fletcher, of Amistad, relates his experience as a new settler in that region of semi-arid Texas: "I landed with my emigrant outfit

Corn, Cane, Potatoes.

Watermelon.

April 19, 1907. I, at once, put up my tent and began keeping 'batchelor hall.' About the first of May, I commenced breaking ground and that season got forty acres under cultivation in Indian corn, kaffir corn, maize and cane. I also raised enough potatoes for home use. I had a good garden and fine melons. Some watermelons weighed forty pounds. After I planted my crops, I built my house and had it ready July 4. Then I went back after my family and stock, returning about first of September. I put in the rest of the time harvesting my crop, digging a well and getting ready for the next year's crop. I broke out considerable land during the winter so that I had all told sixty-five acres ready for 1908 crop.

Alfalfa.

Potatoes.

"I put in fifteen acres of alfalfa securing a good stand, although 1908 was the driest year, old settlers tell me, for seventeen years. If this experimental planting does well, I shall greatly increase my acreage of alfalfa. It has been claimed potatoes cannot be raised here, but I think I have proved the contrary, for, even in the dry year of 1908, I have fine potatoes yielding at least 100 bushels per acre. A man coming here must expect to work hard and intelligently, adapting himself to circumstances. If he does this, he will make a success. It lies as much with or in the man as with the country."

TURKEY.

Precipitation.

Summer Fallow.

Grain Failure.

From a semi-arid region of Turkey, we obtain the following facts, given by Pres. John H. House, Thessalonica Agricultural and Industrial Institute, of Salonica, Turkey: "About 1,000 acres are being dry farmed here with many thousand more, possible. The rainfall is from 12 to 15 inches. Most of this moisture comes from December to April. Alternate summer culture is the general rule here and has been, from time immemorial. This dry farming has been practiced in vine culture very successfully no body knows how long. The success in grape culture is almost phenomenal. Winter grain and spring crops have been largely a failure. This last season (1908) we had a prolonged drouth, lasting from April 2 to November 11, yet I am pleased to record that grapes, wheat and barley made a crop with this untoward condition.

(1) UTAH.

Summer Fallow—Winter Irrigation.

Walter C. Lyman, Grayson (San Juan county), declares irrigation water scarce all over his county. Winter irrigation practiced to some extent; summer fallow used on all dry farms. This plan has been practiced and good crops grown for several years. He declares that these methods pay a good profit on $50 land, and grain and alfalfa are being very successfully grown.

Precipitation.

J. C. Hogenson, of Logan, says: "I have had twenty years experience in dry farming. The altitude of this locality is 4,500 feet, precipitation about 15 inches per annum. We successfully grow, without irrigation, wheat, oats, barley, corn, alfalfa, both for seed and forage.

Acreage Yields.

Grain yields from eight to 60 bushels. Alfalfa for forage, two to three tons per acre.

Grain Quality

"It has been determined, by actual tests, that grain grown upon arid land is of a better quality than that grown under irrigation, that is, it has a higher protein content than that grown under irrigation, or oats grown in a humid climate. If it is the case, then I believe I can look forward with certainty to the time when the dry land districts will become the granaries of the world—when the flour, ('the staff of life'), will be largely grown upon arid land."

George L. Farrell, of Smithfield, is the veteran dry farmer of Cache Valley, where he has successfully "dry" farmed for 44 years. His work and his experience are described in the address given by Mr. Farrell and published in the convention report.

Precipitation.

Paul Droubay, of Erda, gives the following interesting experience: "Altitude, 5,000 feet; rainfall, 12 inches; most of the moisture coming

Soil Treatment.

from November to June. I have had 20 years' experience here, which teaches me that we want good soil; must plow deep at the right time; make thorough preparation of seed bed; seed early; must not use too much seed; should crop alternately and summer fallow. This, when properly done, on suitable soil, is **dry farming**, and will be successful.

Diversified Crops.

We grow crops of small grain, alfalfa, (have raised as high as 10 bushels of seed per acre). Garden vegetables and fruit—peaches, apples, cherries, pears and brush fruits. I am certain where water can be obtained to start the trees and proper cultture is given the orchard afterward, fruit raising can be carried on successfully."

Acreage Yields.

John Buttars, living at Clarkston, states that farmers in that district have been cropping non-irrigated lands for 25 to 30 years. They have been getting yields of 16 to 40 bushels per acre of wheat, oats and

Soil Treatment.

barley, and one and a half tons of alfalfa per season. They, too, have found alternate cropping best, since the more the land is worked in the summer (at the surface), the better the moisture stays. They plow six to 10 inches deep, according to the nature of the soil.

Precipitation—Dry Land Acreage.

J. W. Paxman, of Nephi, reports 13 inches of rainfall, coming largely from November to May. He says his district is farming 20,000 acres without irrigation and it is possible to thus cultivate 50,000 acres. They have been farming in this way above the ditch for ten years. The

Soil Culture.

ground is given summer culture every other year, being plowed in the fall, harrowed in the spring, cultivated during summer and wheat drilled in early September. Growing wheat is harrowed the following spring, harvested in August and the land fall plowed eight to ten inches deep. In a limited way some orcharding is being carried on. Some fine peaches have been produced from trees five to six years old.

Summer Fallow—Auxiliary Irrigation.

Peter Clegg, who has resided at Tooele for 18 years, reports summer fallowing a success, annual cropping a failure for his district. This past year (1908) the district had a good crop, winter wheat come up well and shows a fine prospect for 1909. The water supply for the district is limited and dry farming is carried on in connection with small irrigated farms over a portion of the district.

(m) WASHINGTON.

Acreage Yield—Precipitation.

Guy Waring, of Pateros, says dry farming has been carried on in his district for many years with good results. Annual precipitation, 18 inches; altitude, 800 feet. Moisture falls mostly during the winter months. Wheat, corn, potatoes and alfalfa are the staple crops. Small grain yields from 10 to 35 bushels; alfalfa, one to three tons per acre. Deep plowing and thorough cultivation is the general practice.

Precipitation—Summer Fallow.

A. I. Odegard, living at Quincy, gives report for his section: "The full south half of my county, (Douglass), is dry farmed. Our rainfall is 10 inches, most of it coming from November to March. Altitude, 1,350 feet. We practice summer fallowing; annual cropping is impossible.

Acreage Yields.

We have not been able as yet, to get alfalfa started. Winter wheat is our main crop, yielding from 10 to 25 bushels per acre."

(n) WYOMING.

Precipitation.

William Boyce, of Granite Canon, living at an altitude of 7,373 feet, reports an average of rainfall of 16 inches. "Most of this moisture," he says, "comes from the first of April to the first of September." Dry farming has been practiced by some farmers or ranchmen in that region for 32 years. There has been a sufficient amount of rainfall, so distributed as to produce good crops of wheat, rye, barley, field peas, oats, flax and vegetables for 17 years.

Diversified Crops.

Soil Treatment.

"Deep plowing and thorough preparation of the soil before seeding, retaining winter snows from blowing away will insure success. After sod land has been broken and decayed, a given amount of moisture will penetrate the soil fully twice as deep as it will before the sod is broken.

Potatoes.

Potatoes are the best paying crop that the dry farmer can raise on Wyoming soil. I sold 2,000 bushels of potatoes from 10 acres this last season."

Crop, Yields, Profits.

Andrew T. Malin, of Laramie County, has been dry farming for 10 years. He successfully grows turnips, oats, rye, wheat, barley, emmer, millet, potatoes, pumpkins, alfalfa and timothy. Small grain yields 15 to 30 bushels per acre. He is quite certain he can make 25 per cent. profit on his farm, besides, "keeping the wolf from the door." His neat commodious home and well improved farm well stocked, demonstrates the truth of his assertion, for it is one of the best farms in eastern Wyoming.

Soil Treatment—Auxiliary Irrigation.

Chas. A. Sherman, of Manville, has cropped non-irrigated lands for 20 years. He breaks the sod with oxen and plows a little deeper each year. He grows small grain, vegetables, alfalfa and brome grass on his farm. He often cuts 600 pounds of brome grass seed per acre. Most gardens in his district are irrigated from mills.

Crop Rotation.

Stephen Haines, of Pine Bluffs, has had eight years' experience, farming without irrigation in western Nebraska and at Pine Bluffs. He says he has had best results with one cultivated crop thoroughly worked, followed by one or two small grain crops. He suggests that farmers do not cut all the corn for fodder, but leave at least 10 rows in the field to catch snow and retain it. He thinks farmers should not turn live stock in the stalks before December.

Summer Fallow—Yields.

George F. Chapman, Evanston, reports that he has successfully grown crops by alternately summer fallowing non-irrigated land. He has grown oats, barley, alfalfa and sugar beets,.

Potatoes Sugar Beets.

Potatoes produced from 150 to 300 bushels per acre, sugar beets, from 13 to 22 tons per acre. Altitude 6,300 feet, rainfall, 15 inches. Deep plowing and constant cultivation give the best results.

Acreage Yields.

Russell Thorpe, of Lusk, has been dry farming for 15 years at an altitude of 5,000 feet. His crops are oats and grasses. The former yields 25 to 40 bushels per acre, the latter, one to two tons per acre.

E. Blain of Cambria, is a very successful dry farmer. He carried off the trophy cup at the Third Dry Farming Congress, offered for the best oats grown in 1908 within the state of Wyoming without irriga tion. His oats averaged him 60 to 65 bushels and weighed 42 to 44 pounds per bushel.

Acreage Results.

J. A. Gisber, who lives at Albin, says he has farmed "above the ditch" for 15 years with very good results. His plan is to plow deep and thoroughly work the ground. He grows small grain largely, with the yields of 14 to 39 bushels, and potatoes 100 to 300 bushels per acre.

Live Stock Fattening.

A. Christian, Sr., who lives near Kirtley, Converse county, says he has farmed 250 acres of non-irrigated land for 20 years. He says that from his experience, dry farming should always be done in connection with stock business. He regards 100 acres in crops, as the minimum for a dry farmer, and recommends the use of four horse farming machinery as much as possible.

Soil Treatment.

He plows as deep in spring, as possible, thoroughly harrows and seeds with heavy press drills.

Crop Rotation—Yields.

His rotation is grain 3 years, then corn or potatoes with miscellaneous feed crops. Yields have been, on the average, wheat, 18 bushels; oats, 30 bushels; potatoes, 75 to 200 bushels per acre. Emmer, alfalfa, corn and other feed crops were grown for forage and not weighed.

Soil Treatment.

The pioneer "dry farmer" of Wyoming is undoubtedly Judge Whitehead. He came in 1867 long before Wyoming became a state. His first farming was on Horse Creek near South Bend. Here he very successfully grew crops of corn, wheat, oats, sorghum and vegetables. Speaking of his farming experience, he says: "I confidently believe that dry farming will be a success as carried on at this time. My experience teaches me that deep plowing, early planting, with a light cultivation and right selection of seeds are essential to success.

Storing Flood Water.

"There is one thing that the new settler will find very beneficial. Where possible, select ground so situated, as to receive flood water or what moisture falls and runs off from the adjoining ground. When plowed deep and cultivated, the ground absorbs a large amount of moisture. In this way, the overflow can be utilized and there is no doubt that the greater the amount of water received, by whatever means, the more assurance we have of a good crop. I have tried this plan on my ranch near Guernsey. Here I have quite successfully grown crops without irrigation."

II. FUNDAMENTAL SUGGESTIONS GIVEN AT PREVIOUS SESSIONS OF THE DRY FARMING CONGRESS.

1. Precipitation.

Relative precipitation data for western states—compiled by Dr. R. J. Hayatt, Section Director, U. S. Weather Bureau, Salt Lake City, Utah.

STATES	LOWEST Average inches	HIGHEST inches	STATE MEAN inches
East Washington	6.63	28.73	
West Washington	21.16	131.01	39.23
East Oregon	8.63	79.42	
West Oregon	19.19	133.72	37.93
California	1.79	78.08	26.15
Arizona—			
West portion	2.60	7.38	
South portion	5.99	23.60	11.82
Nevada	5.26	24.90	10.10
Idaho—North section	13.90	38.55	
South Section	6.35	15.07	17.44
Central Section	14.23	23.36	
Utah—			
North Section	5.97	19.04	
Central Section	4.13	13.31	
South Section	5.18	20.70	12.29

Montana—			
East Portion	12.80	18.75	
West Portion	12.56	22.63	15.34
Wyoming	10.04	18.68	14.31
Colorado	6.43	25.59	16.42
New Mexico	3.91	18.79	13.45
North Dakota	13.28	20.68	17.79
South Dakota	13.54	28.98	21.45
Nebraska	14.32	36.04	24.42
Kansas	15.40	44.54	27.77
Oklahoma	19.27	42.37	31.83

Evaporation.

2. Evaporation table, showing total evaporation, in inches, for crop season April 1 to October 1, compiled by Dr. L. J. Briggs, U. S. Department of Agriculture, Washington, D. C.

Evaporation is a factor of equal importance with precipitation in determining the agricultural productiveness of a region. By the term "evaporation," is meant the number of inches of water which vaporizes or evaporates from a clear water surface in a freely exposed open tank during a given period. Thus the annual evaporation is the total number of inches of water which evaporates during the year, just as the precipitation is measured by the total number of inches of water falling into the tank as rain or snow during the year. Evaporation depends upon the temperature of the evaporating surface, the dryness of the air and upon the velocity of the wind. The hotter the day, the greater the evaporation, the dryer the day, the greater the evaporation; the harder the wind blows, the greater the evaporation.

The amount of evaporation from an open tank of water thus becomes a measure of the combined action of the different factors which determine the evaporation in that locality. The higher the evaporation from the tank, the greater is the demand made upon the crops and soil for moisture.

Settlers looking into the possibilities of the new country inquire only regarding rainfall. The evaporation is not considered. This is doubtless due to the unfortunate fact that the evaporation data are not yet generally available. Such records would be of great value to the settler. In dry farming the most favorable region, other factors being equal, is obviously the one with the lowest evaporation. The demands upon the moisture in the soil are here the smallest and, in times of scanty rainfall, the settler has a proportionately better chance to mature a fair crop..

2. EVAPORATION DATA IN INCHES.

Texas, 45; Nebraska, 41; Kansas, 45; South Dakota, 32; North Dakota, 30; Wyoming, 37; California, 34-57; Colorado, 29-49; New Mexico, 55; Arizona, 53-56; Utah, 31-34; Nevada, 43; Washington, 24.

The greater the evaporation in any given locality, the harder must the settler work to conserve moisture sufficient to produce his crops. The character of rainfall, prevalence of hail, frost, hot winds, high winds, the physical property of the soil of the locality—its depth, porosity, tendency to bake and clod, and the amount of organic matter and plant food it contains, are all factors which the prospective settler should consider.

3. FORTY-FOUR YEARS' EXPERIENCE AS A DRY FARMER.

By Honorable Geo. L. Farrell, Smithfield, Utah.

I began farming in Cache valley in 1864, farming in the same manner I did in the region I came from. I failed miserably for two years.

I always hated to be overcome and I determined to either win out or "go broke."

I had been plowing three to four inches but I tried plowing down to eight and more inches. I also sowed less than half the grain I had been sowing. The result was that I had something to harvest.

Result of Methodical Work.

I took encouragement, and, the following year, seeded 110 acres of deep, well plowed land to wheat, using but 30 to 35 pounds of seed per acre. I harvested exactly 40 bushels and eight pounds per acre. I found that by seeding on a better prepared seed bed, with less seed, I had larger heads and more rows of wheat kernels per head.

Thin Seeding.

When we sow grain too thick on dry farms and it comes so thick, it draws the substance and moisture out of the ground, until there is not enough moisture to support it and the grain fails to fill out—does not mature.

One year, I hired a Dane to seed my rye—100 acres. I required him to seed exactly one-half bushel per acre. He felt I made a very great mistake for "back home," in Denmark, they seed three bushels per acre. He seeded five acres on his home farm, using 15 bushels of rye to seed it. I harvested 27 bushels per acre over my entire field; the Dane harvested 20 bushels from his five acres, only five bushels more than he seeded, one kernel of my rye would make 12 kernels of his rye.

Tree Planting.

A genleman from the United States Department of Agriculture visited me in 1907 and expressed surprise at my fine box elder trees, 12 to 13 years old. This type of tree gives ample shade and is well adapted to dry farming if only they are put down right in the first place. When I planted those trees, I dug holes down until I got moisture. If I got down to moisture in two feet, I stopped; if I had to go three feet, I stopped there. The trees which I planted were about 10 feet long and one inch thick. I trimmed all the limbs off and set them down. I put those down to moisture in the beginning—they have been in moisture ever since and are doing well.

Summer Fallow Soil Treatment.

Our plan of cropping has always been to summer fallow one year and crop the next. If possible, I plow in the fall; as a general thing we cut our grain stubble as high as possible, say two feet. When we turn that under, there is plant food to help the next crop.

Conserving Moisture—Seeding.

When the fall and spring rains come on well prepared ground, it goes down. The next spring as soon as it is dry enough to work, we put our disks on the summer fallow and work over the top; this conserves the moisture in the ground below and we continue to work that ground all summer to keep down the weeds. We keep the summer fallow as clean as possible. Just before the seeding time, we thoroughly level the seed bed with the leveller.

We find it wise to sub-soil six inches deeper, then we plow every three years, we do not throw the sub-soil dirt out, simply leave it loose in the furrow. By studying climatic seed and soil conditions, no earnest worker need fail at dry farming in Utah.

4. SYNOPSIS OF RECEIPTS AND EXPENDITURES, CROPPING EIGHTY-EIGHT ACRES TWENTY YEARS.

By Senator Jno. G. Barnes, Kaysville, Utah.

The field was a total of 90 acres, but some years but 89 acres, and again but 84 acres were seeded, so the average acreage seeded to crop in this field was 88. Summer fallow was given the ground some years, twelve crops were grown in the 20 years. Results were as follows:

First crop: failure, plowing and seeding, $2.75 per acre.

First Crop—Failure, plowing and seeding, $2.75 per acre.

Second Crop—Total cost, $572.00, or $6.50 per acre; sold for $1,294.00, or $14.70 per acre.

Third Crop—Volunteer, total cost, $202.50, or $2.30 per acre; sold for $863.85, or $9.81 per acre.

Fourth Crop—Total cost, $572.00 or $6.50 per acre; sold for $1,116.70, or $12.69 per acre.

Fifth Crop—Total cost, $528.40, or $5.55 per acre; sold for $1,116.50, or $13.25 per acre.

Sixth Crop—Total cost, $418.00, or $4.00 per acre; sold for $885.25, or $10.00 per acre.

Seventh Crop—Total cost, $398.20, or $4.52½ per acre; sold for $1,166.50, or $13.25 per acre.

Eighth Crop—Total cost, $475.20, or $5.40 per acre; sold for $938.30, or $10.66 per acre.

Ninth Crop—Total cost, $360.80, or $4.10 per acre; sold for $1,722.00, or $19.55 per acre.

Tenth Crop—Total cost, $453.20, or $5.15 per acre; sold for $909.38, or $10.33 per acre.

Eleventh Crop—Total cost, $664.64, or $7.53 per acre; sold for $1,082.45, or $12.30 per acre.

Twelfth Crop—Total cost, $352.00, or $4.00 per acre; not yet disposed of.

Business Management.

The field is charged with seed bed preparation, seeding, cultivating, heading threshing, hauling to warehouse, boarding threshers, plowing fire guards around the stacks, and so forth, although all the work was done by the farmer. Wheat was the crop grown and during crop years named above, the yield varied from 10 to 28 bushels per acre. The net profit, after counting expense for all the farm operations, varied from $4.77 to $15.45 per acre, or a revenue of $419.76 to $1,359.60 per crop year on the field.

Acreage Yields.

5. DAIRYING UNDER DRY FARMING CONDITIONS.

Abstract of address by Professor E. H. Webster, Chief Dairy Division, U. S. Department of Agriculture:

Most dry farming crops, as all crops everywhere, bring in an income but once a year.

Sometimes the work of a year may be swept away in a moment by flood, or hail, or fire and sometimes the heavens fail to give forth the necessary rain for dry farming even, and the crops are a failure.

To the farmer in seasons like this, comes the pinch of hard times. Bills must go over; but the family must be clothed and the children sent to school. With an empty granary and no other source of income, this is sometimes impossible. Seldom, however, is there a year when feed of some kind cannot be raised for a bunch of dairy cows. Many times grain crops, that may be utter failures from the standpoint of the grain they yield, may still be turned into hay or fodder or silage—excellent food for the stock—and total loss avoided. The farmer who keeps cows will plant forage crops which are reasonably sure and plan to make silage and hay that will carry him over the season. Much roughage that would otherwise be lost, may thus be turned to good account.

Forage Crops.

Dairying.

The one great advantage of the dairy cow over other live stock is the fact that she pays dividends every day in the year, in a commodity that is convertible into cash at the nearest station or at the nearby factory for the making of butter and cheese.

Forage Crops.

It may be said that one of the greatest drawbacks to farming is the lack of ready cash every day in the year. This condition never exists on a farm where there is a dairy herd. Speaking more particularly of the Great Plains country, east of the Rockies, there has been but one or two years in the last 20 or 25 when there could not have been enough feed raised on the average farm to support a herd of from 15 to 20 cows in fair shape. But there have been many years, when wheat, corn or other cereals on which these people depend, have been utter failures.

The great region has since the early eighties, been twice populated and depopulated; and now, for the third time, the people are again possessing themselves of the land. If the third exodus does not sometime take place, it will be because the present generation is wiser than their predecessors and because they practice improved methods of farming, which will include dairying as a component part.

6. METHODS OF DRY FARMING IN UTAH.

Abstract of address by Prof. L. A. Merrill, Salt Lake City.

I have heard, even in our state, where we are farming successfully, a great many farmers say they depend very much upon May and June, when the showers come. I want to say, if you will follow this through, the years that we get results are the years when we have light rains during the growing season.

Precipitation.

The rains which come in May or June should be light, simply because that is the period we want to be our period of drouth, if we are going to have any period of drouth. You want the roots of the plants to extend down deep into the ground and not spread out over a large area, and if the rains come in the early spring months, the roots have a tendency to spread out near the surface, and, if the water is very near the surface we get a shallow rooted plant. We want the plants to have a tendency to send their roots down deep into the soil and for that reason we don't care whether the rains come during that particular season

Conserving Moisture.

of the year, and, in fact, would rather they would not. It has been demonstrated that we can go for months without any rainfall, at all, if we have the moisture stored in the soil. There are places in this state where they have been storing and conserving moisture for 10 to 20 years, keeping it stored up in the soil. When the plant is put into that soil, there is sufficient moisture to carry it through, whether it gets any rain or not. That is the idea we are trying to follow in dry farming in Utah.

Deep Plowing.

We believe in deep plowing, because we want this moisture to spread down around each one of the soil grains. When Bishop Farrell first started his experiments in Cache valley, many years ago, and Mr. Salisbury started his experiments, they both had this experience.

Seeding.

They went out and sowed the same amount of seed on their land, as they had been accustomed to sowing on irrigated land—a bushel and a half and two bushels and a half—and, as a consequence, there was not sufficient moisture in the ground to nourish all the plants. The plants came up and, there not being sufficient moisture in the ground to carry them through, they withered and died. Mr. Salisbury said that his failures during the first three or four years were simply because he did not learn the great lesson of putting only sufficient seed on the land to be reconciled with the amount of moisture present in the soil to carry

Light Seeding.

it through. So now it has come in Utah that we are advocating the idea of seeding a very small amount of seed. Deep seeding, seeding with a drill, putting it down where the moisture is found, are the means by which we have been able to succeed in dry farming in this state. Our great problem is the best way of conserving what moisture we have.

Acreage Yields.

It has been demonstrated time and time, and again, that a yield of 33 bushels of wheat can be produced on land fallowed every other year, while if the same field is cropping annually, the yield is cut down 12, 13 or 14 bushels. We find also that we do double the amount of work to produce 12 or 13 bushels which is required to produce 33 bushels. So we can say, it has been demonstrated and is conceded that our summer fallowing is a matter of preserving the moisture.

7. DRY LAND INVESTIGATIONS IN GREAT PLAINS AREA.

Abstract from address at the Salt Lake Congress by Prof. E. C. Chilcott, in charge, Office of Dry Land Agriculture, U. S. Department of Agriculture.

"This I conceive to be the legitimate function of the Office of Dry Land Agriculture. It is to afford facilities for bringing into the field of investigation of the scientific problems of dry land agriculture, a corps of trained scientists, each one a specialist in some one line, these men may prove to be "troublesome experts" who will "cast discredit on the slippery sport" of "holding the eel by the tail," if there chance to be those who are still addicted to this slippery sport. They certainly will "submit to all mortifying tests" any theories that may be advanced concerning the practice of dry land agriculture in the Great Plains area, and it is quite possible that they may play havoc with some systems and theories that are "so beautiful that they are their own excuse for being." But the fact that the conclusions arrived at by these experts will be the consensus of opinion of a considerable number of trained specialists, serves to completely eliminate the personal element and ought to give greater weight to their conclusions than would attach to any other body of investigators along the same line, not so much on account of individual superiority as investigators, but because they have better facilities for carrying on their investigations over a wide area under a system that subjects the work of each, to rigid scientific scrutiny of all the others.

It must not be understood that the work of these investigators is primarily destructive, for such is not the case. Their work is constructive and conservative. Theirs will be a search for the truth, and any fact, theory or system that will stand test of rigid scientific methods will be welcomed by them, no matter what its source.

Government Co-Operation.

A residence of twenty-five years in the Great Plains, during all of which time I was in close touch with the agricultural problems, convinced me that no progress could be made toward a solution of the fundamental problems of dry land agriculture until a large number of trained experts could carry on thoroughly systematized investigations at a considerable number of representative stations distributed over a wide area having somewhat similar soil and climatic conditions and that these investigations must be continued uninterruptedly for a long term of years. When I was called to Washington to organize the work in dry land agriculture investigations, I accordingly established the work on this basis. I first planned the co-operation of trained experts on soil physics, meteorology, chemistry, plant physiology, plant breeding, cereal investigations, and later pomology, forestry and animal husbandry. I then thought of, and, in some instances obtained, co-operation with the state experiment stations throughout the Great Plains area. We have now eleven stations in successful operation, seven of which are in co-operation with state experiment stations and four of them independent.

The general plan of work for all the stations is the same, so the results obtained at each station are strictly comparable with those of all the others. Great care was taken in the selection of the land in order to secure uniformity and work has, in every way, been conducted according to the most approved methods. At each station from 75 to 150 plats are used for investigations on crop rotation and cultivation methods. They are divided into three groups. One for testing methods of soil preparation, continuous cropping with and without special precaution for moisture conservation, alternate cropping and summer tillage; one for testing the effect of crop sequence and time of plowing; and one for testing the effect of humus of conservation by the plowing under of green manure crops, both legumes and non-legumes being used.

The work is so arranged to allow of an elaborate and accurate system of cross-checking, not only between plats and rotation of a single station, but also between those of all the stations.

In this way, practically all of the various methods of agricultural practice in common use in the area, as well as these which have been advocated and advertised as "new" are being thoroughly tested under rigidly scientific methods, which should give thoroughly reliable quantitive values for each and every practice.

Experiment Stations.

We want to carry on these investigations long enough so we can find, in a given locality, which practice will result in the best way on an average through a long term of years. Our co-operative stations are located at Judith Basin, Montana; Dickinson and Edgeley, North Dakota; North Platte, Nebraska; Hays and Garden City, Kansas. The independent stations are located at Belle Fourche, South Dakota; Akron, Colorado; Dalhart and Amarillo, Texas.

All of these stations are equipped with necessary tools, implements, etc. for carrying on the field work, weighing and measuring the results. Each station also has a full set of the instruments for measuring the various meteoroligical and physical factors. This part of the work is under the supervision of Dr. L. J. Briggs, Physicist of the Bureau of Plant Industry. At nearly all the stations work in cereal investigations is being conducted by Prof. W. M. Jardine, Assistant Cerealist, Bureau of Plant Industry. At some of the stations investigations in soil bacteriology have been carried on.

8. DRY LAND GRAINS.

By Prof. W. M. Jardine, Assistant cerealist, Department of Agriculture, Washington, D. C. An abstract giving conclusions at close of his address at Salt Lake Congress.

I would like to give you a concrete conception of cereal production as I view it

Seed Breeding.

I. From a disorganized condition, the production of cereals, especially wheat, has, through the introduction of foreign varieties of grain, elimination of inferior types and a uniform system of grain growing, become concentrated into four belts, more or less distinct and with one exception characterized by the production of one or two standard varieties especially adapted.

Durum Wheat.

II. That the durum wheats have proved themselves especially valuable as spring types, particularly as regards drouth and rust resistance and that they will ultimately become the leading spring type.

Winter Wheat.

III. That winter wheats will always be grown where wheat can survive winter conditions, and that the Crimean group, because of their wide adaptibility, excellent quality and ability to withstand drouth, will probably supplant all other winter types in all the belts with the possible exception of the Pacific area.

IV. That the only possible way to obtain steady and permanent market for grains is to concentrate on as few types as possible, this being especially necessary in the inter-mountain area at the present time.

Diversified Crops.

The cereals which are grown under arid conditions are: wheat, oats, rye, barley, spelt, emmer, corn and the grain sorghum. All of these cereals occupy important places in arid farming.

9. "DRY FARMING."

Abstract of an address by Prof. E. D. Ball, Director, Utah Experiment Station, given at the Salt Lake Congress.

I remember of traveling miles and miles—hundreds of miles, I was going to say—in eastern Colorado, western Nebraska and western Kansas, over abandoned farms. That was my first introduction to arid farming. But it did not discourage me. It discouraged thousands there and they left. I looked over that land and I looked over it from the experience I had in Iowa, and I said to myself, "That land will raise a crop, if it is treated properly." As an entomologist I traveled over that country.

Causes of Failure.

I had nothing to do but to handle their insect pests; but I found it to be almost universally true that the man that telegraphed for help to get rid of his insect pests was the man that put his harrow in about an inch deep. The man that put his plow down there and plowed his ground never sent for me.

The men who went out there knew absolutely nothing of the principles we are trying to work out today. They thought all they had to do was to do what they had done in the eastern states and they would raise a crop.

They failed and they will fail everywhere in the west, where that kind of a proposition is attempted.

10. DRY FARMING IN NEW MEXICO.

By John J. Vernon, Agriculturist, Agricultural College of New Mexico.

[The conditions in New Mexico being very similar to those throughout the entire southwest, this extract of Bulletin No. 61 of the college will be helpful to all in that district.]

Since New Mexico is located a little south of Utah we may expect that, other things being equal, somewhat more water will be required to grow the same kind of crops in the former than in the latter.

Conservation of Moisture.

The discussion of the quantity of water required by plants at once impresses one with the extreme importance of conserving the soil moisture. If there were no losses of soil moisture other than through the plant itself, profitable crops could be grown over a very large portion of New Mexico. But in fact, the most constant effort is required to prevent the surface evaporation whereby a large portion of the rainfall is dissipated without doing a particle of good to the growing crop.

Those crops that require the least amount of water to bring them to maturity or that occupy the ground a short period of time, of course, are best suited to semi-arid conditions, or may be most quickly developed into strictly dry farming crops.

Systems of Dry Farming.

For convenience dry farming may be divided into three main systems: 1. Crops annually,—a system whereby a crop, whether heavy or light, is grown every year. Probably crops may be grown every year with say 18 inches of rainfall, provided the proper methods are followed and the rainfall is property distributed for storage and cropping. 2. Crops biennially—a system under which crops are grown only every other year. In Utah yields of 30 bushels of wheat per acre have been obtained every other year with an annual rainfall of 12 inches and good crops biennially have been reported with an annual precipitation of only eight inches. The soil was of an excellent character and the methods employed were up-to-date. 3. A modification or combination of the first and second. Under this class may be mentioned the production of two crops in three years, three crops in five years, or two crops in one year, one being a catch or cover crop, sown for its effect upon the soil or the soil moisture, to be plowed under before the regular crop is sown.

Biennial Cropping.

The system chosen for any section must necessarily depend upon a number of conditions, among which may be mentioned: The rainfall; the distribution of the rainfall; the length of the growing season; the general climatic conditions, such as the humidity of the atmosphere, the number of cloudy and clear days, the day and night temperature, and the windsweep; the elevation; the general aspect of the country and the farm; the character of the soil and subsoil; the depth of the soil and subsoil; the machinery available; and last but not least, the means for the disposal of the products.

Diversified Crops.

There is quite as large a range for adaptation, amelioration and breeding with dry farming crops as with those grown under humid conditions. The necessity for such effort is far more urgent, and the reward quite as promising.

Crops must be selected or developed that will fit the environments, and there seems to be quite as large a field for investigation in the improvement and development of crops suited to the various conditions in the dry farming sections as in the improvement of methods of handling the soil. In other words the pedigree of the seed is quite as important as the cultural methods. Neither should be neglected. Certain machines are designed for certain kinds of work. Certain breeds of animals are selected for special results. No one would think of trying to harvest wheat with a threshing machine. No one would for a moment think of placing a thoroughbred Herford cow in the city dairy. So we must select kinds and classes of seeds for our particular purposes. If the rainy season is short, early maturing crops must be selected, those having a short period of growth. If the rainy season is preceded by a rather long period when the moisture content of the soil is rather low in spite of the means employed to increase it, then crops should be chosen that will make the necessary early growth with a minimum amount of moisture and later be pushed forward to rapid maturity when the rainy season sets in. Still other crops or strains of seed must be selected wherever the moisture content of the soil is ample throughout the growing season. Under such a condition it would be quite useless to grow crops bred for and adapted to a very short season's growth. The dry farmer must not neglect the cultural methods, but he must not be tied to the idea that the way in which the soil is handled is the only essenial. The kind of crop and the class or strain of seed used are factors which ultimately will have much to do with the result.

Seed Adaptation.

It has been demonstrated by repeated experiments that crops can within certain limits be adapted to new and different environments. Acquatic plants in time have adapted themselves to and become dry land plants. So to plants that for centuries have grown in conditions of abundance of moisture, have gradually become adapted to conditions where there was very decidedly less moisture. This very wise provision of nature supplies the means whereby man is able to transport and adapt crops to new and heretofore untried conditions. He is only barred in his progress by the limitations nature has set.

Seed Breeding.

There is little doubt but that strains of seed of certain crops which have been successfully grown for years under trying semi-arid conditions will be in great demand. As a result of this demand we may reasonably expect pedigreed dry farm crops to appear and they will fill an important want.

To give a list of crops suited to dry farming for all sections and conditions is practically impossible. Crops that are well suited to a certain class of conditions would be wholly unsuited to another. Therefore, the following brief list must be considered only as suggestive.

Cereals.

Seed Selection.

Wheat stands at the head among the cereal crops for dry farming areas and it probably stands at the head of all crops for this purpose when everything is considered,—adaptibility to dry farming conditions, cost of production, profits, etc. There are certain classes of wheats that do best under drouthy conditions. The durum or macaroni wheats seem to do exceedingly well when compared with other classes, yet there are varieties among other classes which also do well on dry farms. Spelt, oats, rye and barley are all used on occasion. Barley is probably the poorest crop mentioned because it is comparatively a shallow rooted crop and for this reason, likely to prove less valuable than a crop which forages more deeply for its food..

Sorghums.

Cane Crops.

Both saccharine and non-saccharine sorghums are grown. Fodder cane, kiffir corn, Jerusalem corn and doura belong in this class. They should be sown for hay with a hoe drill or planted with a corn planter and cultivated. The sorghums may also be double rowed, i. e., planted in groups of two rows about eight inches apart and cultivated.

Millets.

Among the millets are found some of the most paying dry farm crops. Some of them grow and mature with a remarkably small amount of moisture present in the soil and at the same time the period of growth is very short.

Legumes.

There are a few legumes that have shown value as dry farm crops. Peas, beans and alfalfa are the most promising although in order to secure a stand of alfalfa it will very probably require summer fallowing one year in order to accumulate sufficient moisture to insure perfect germination. After a stand is secured alfalfa has given good results in some sections. The alfalfa should be sown with the hoe drill and rather deeply for small seed.

Vegetables.

Garden vegetables form an important group. They add so greatly to a bounteous table supply. Many vegetables grow to the proper stage. for consumption in a few weeks, and therefore, are surer than almost any other class of crops. If markets are available they may be made a source of considerable revenue.

Trees.

Both fruit and shade trees are grown in districts where dry farming is practiced. The home surroundings may be made more comfortable and greatly improved in appearance by the free use of shrubs and trees. The same care, however, must be exercised in the selection of the kinds to plant and in their care as is used with field crops. The first two or three years, until they become deeply rooted, is the most critical period in the life of a tree or ornamental shrub. Cultivation during that period should be constant and thorough.

There are no doubt many crops not mentioned that have proven or will prove their value for dry farming purposes.

Soil Treatment.

Plowing is the most important factor connected with dry farming operations. If the plowing is not properly done an adequate water reservoir will not be formed in which to store the rain or snow fall. Should this feature of the work be neglected much of the rain and melting snow will run off from the surface of the ground and be lost instead of sinking into the soil, there to be stored.

Plowing, if possible, should be performed when the soil is fairly moist, so that it will come up mellow and can easily be leveled and fined. Disking immediately after the crop is removed will aid materially in this respect.

Deep Plowing.

The character of the soil and the season of the year will largely determine the depth to which it is best to plow. Usually the plowing should be from eight to twelve or more inches deep if done in the fall, obviously somewhat shallower if done in the spring.

The subsoil plow may follow the plow if after due trial upon small areas it proves beneficial upon that particular soil and subsoil and under the conditions prevailing. The plow should be followed by the sub-surface packer, especially if the plowing has been very deep. If a sub-surface packer is not available the field should be run over with the disk set straight but well down. The sub-surface packer should be followed by the acme harrow or toothed harrow, thus thoroughly pulverizing and fineing the surface so as to form a good mulch and at the same time provide against any surface run off of the water that subsequently falls.

Sub-Surface Packer.

The sub-surface packing and the formation of a surface mulch should be performed each half day. If the soil is left loose and a large surface exposed to the air for only a few hours, large quantities of moisture will be evaporated, pass off into the atmosphere and be lost to the crop. Success often lies in the proper performance at the right time of these seemingly insignificant operations.

Soil Mulch.

Experiments, often repeated, have proven that the evaporation of moisture from a soil surface is least when that surface is least exposed to the air. It follows, therefore, that any irregularities in the surface increases the surface exposure, which in turn increases the evaporation of moisture. The reason for laying so much stress upon following the plow immediately with the harrow is to prevent the loss of moisture from the irregular surface. Level culture with a fine even surface has proven the best method for conserving moisture and for most crops this condition is the most favorable for root development and expansion. There may be conditions of a peculiar nature where this rule will not hold good, though it is difficult to think of such a condition.

Soil Treatment.

Level culture should mean not only a level surface exposure when the work is completed but it should also be made to mean the cutting or stirring of a slice or layer of the surface to practically the same depth at all points. This is usually best accomplished by using a long, flat blade which is run so as to cut an even depth and at the same time stir the soil before it falls back in position. Another means almost as effective is the use of a large number of small shovels. Even small shovels leave an uncut ridge underneath, and a slight corrugation on the surface. Large shovels are extremely harmful since they leave the surface in great ridges and portions of the uncut under-surface exposed to the air.

Seeding and Planting.

All seeding and planting should be done with a machine that will deposit the seed in the moist soil at an even depth and leave a loose surface over it. The depth at which the seed should be sown will vary with the size and viability of the seed quite as if sown under humid conditions, but in dry farming the seed must be deposited not a certain depth below the surface of the soil, but a certain depth below the top of the moist soil. This is an important point. Not infrequently, deep planting will be required, but there is little danger in planting deep under dry farming conditions for the reason that the young plants readily push to the surface through the loose dry surface mulch. Should the seed be deposited in the dry surface mulch it will lie there until a shower comes or until the moisture from below is brought up to it by rolling or other similar treatment.

Fall Seeding of Cereals.

Plowing is a rather slow operation, much slower than disking, and therefore, as soon as the crop is removed from the field (the removal of the crop should be expedited as much as possible) double disk the land by lapping one-half. By disking an excellent mulch is formed upon the surface, thus preventing the loss of large quantities of moisture during the time required to complete the plowing of the land and any rain that may fall sinks quickly into the soil. Furthermore, disking puts the soil in very much better condition for plowing for the reason that the soil will come up in very much better condition after being disked. The plowing should be of such a depth as seems consistent with the character of the soil. It may be found advisable to subsoil.

Seed with a hoe drill rather deeply, say, one inch in moist soil which may make three or four inches below the surface if the dry dust mulch is included in the measurement. The hoe drill covers the seed with a loose layer of soil which prevents the drying out of that portion of the soil surrounding the kernels. Should it happen that the surface soil in which the seed must be sown is too dry for the proper germination of the seed, if it is too late to wait for a shower, there are two methods of procedure that may prove successful. Either sow with a press drill, which leaves the soil over the seed firmed and in turn will increase capillarity from below, possibly supplying the needed moisture to the seed; or immediately after seeding roll the field. Rolling will firm the whole surface and by diminishing the size of the capillary tubes will increase capillarity from below, thus increasing the moisture content of the soil surrounding the seed, which may be expected to cause a normal germination. In most sections the seed should be sown not later than September fifteenth for the reason that by so doing all of the fall rains are rendered available to the crop. As soon as the plants are up, the surface mulch should be immediately formed again by cultivation with the harrow.

Soil Treatment.

Every time the surface mulch is destroyed by rain, it should be reestablished by surface culture with the harrow, or better the weeder, just as soon as it is possible to go upon the land. In the spring surface cultivation should follow each rain or as often as the surface becomes compacted by the settling of the soil particles together, at least until the crop begins to stool or tiller.

Under very trying conditions intertillage has been practiced with cereal crops. It is doubtful if such a system would prove practicable, although a test of its feasibility on a small scale would be commendable. When the crop is six or eight inches high it shades the surface of the soil so effectually that thereafter the surface loss by evaporation is minimized..

Harvesting.

In a dry climate harvesting should begin when the crop is rather green so as to avoid loss by the shattering of over ripe grain.

Spring Seeding of Cereals.

Spring seeding requires the same careful preparation of the field the previous season as fall seeding. The treatment of the soil should be identical with that described under fall seeding with the possible exception that the soil should be cultivated as assiduously when there is no crop as when there is a crop growing upon it. No weeds should be allowed to grow as they pump water out of the soil, and therefore, rob the coming crop of a portion of its moisture. However, if cultivation is sufficiently frequent and thorough to keep up a perfect dust mulch there will likely be very little trouble from weeds.

Soil Treatment.

In the spring cultivate with the weeder as early as possible. A little later when the soil has dried out somewhat give it a deeper surface cultivation either with the acme harrow or the disk. Sow as early as the conditions are favorable with the weeder in order to maintain a loose mulch and continue the cultivation at least until the grain stools.

Time of Seeding.

The time of seeding will depend much upon the time of the rainy season and the distribution of the snow or rainfall. Whether to seed in the fall or spring must be determined after a study of the local conditions. Under a condition where the principal rainfall occurs in midsummer it may not be practicable to seed in the fall. If there is not sufficient moisture at all times between the time of seeding and the rainy season, to carry the crop properly, spring seeding must be substituted. It may even be necessary to seed rather late in the spring on occasion when the early spring is unusually dry. But wherever there is sufficient moisture to properly carry the crop along or under a condition where a large portion of the total precipitation occurs in the fall, winter and early spring, fall seeding is always preferable. Seeding, of course, must always be done at a time when the crop will make the best use of the available soil moisture.

Fall seeding assists materially in the retention of the soil in place about the plant roots because there is a considerable growth above ground before the usual windy season sets in. Herein lies one of the great values of fall seeding.

Light Seeding.

The quantity of seed that should be sown per acre diminishes with the decrease in the amount of soil moisture available to the crop. If, for example, five pecks or 75 pounds of wheat is required for seeding in the humid sections, from one and one-half to three pecks or from 20 to 45 pounds, varying with the precipitations, etc., would be sufficient in the semi-arid belt. The wide difference in the amount of seed required in the humid and the dry farming sections is explainable in the fact that it requires approximately a given quantity of water to produce a bushel of grain. Therefore, if twice as many seed are sown as there is sufficient moisture available in the soil to bring to maturity, all of the seed will grow until one-half to two-thirds mature and there it will stop, for all of the moisture is exhausted. If only one-half the seed had been sown we may assume that up to the same date only one-half of the total soil moisture would be consumed, thus leaving the other half with which the crop could come to maturity. If somewhat too small an amount of seed is sown stooling will be more vigorous and the root development correspondingly more expansive; so that within certain limits the crop will adjust itself to the moisture conditions.

Causes of Failure.

Should a field of grain start off well after seeding, grow luxuriantly for some weeks and then wither and die, do not be too hasty in placing the difficulty. There may be a single or a combination of reasons. A sufficient storage reservoir may not have been formed; the moisture stored may not have been properly conserved before seeding; the after cultivation may have been carelessly done or neglected altogether; or possibly far too much seed may have been sown for the quantity of moisture available. If any one or all of the other conditions should exist, the importance of the last factor would be increased.

Acreage Yields.

It is absurd to believe larger yields can be secured under dry farming conditions than in the rain belt or irrigated sections, unless there be other conditions which bear upon the results other than the amount of water. It requires very nearly the same quantity of water to produce a given product in the different sections, but the difference seems to be in favor of the humid sections. To be just in our consideration of the matter, it must be added that there are certain superior conditions in the semi-arid belt which tend to offset this difference,—cheaper land, easier cultivation, etc. But after all is said pro and con it must be admitted that dry farming crops are as a rule smaller, and ofter much smaller, than those grown in the humid belt or under irrigation.

It is far from my intention to discourage the practice of dry farming. Let the yields be smaller. Remember that these crops are grown upon exceptionally cheap lands and in sections where large holdings are not only tolerated but must necessarily be encouraged. Profits, in the end, must be figured upon the investment plus the cost of working force whether it is man, beast, or machinery, and no such yields are necessary upon $10 and $20 land as upon $50 and $100 land in order to realize a fair profit. A yield of 15 bushels per acre is much better on $20 land than 30 bushels on $50 or $100 land. Furthermore, the conditions are most favorable for extensive operations, whereby the profits may be increased in proportion to the area and investment.

Estimated Profits.

Harvesting and Storing.

After the expense of growing a crop is borne, care and judgment should be exercised in harvesting and storing. If crops are to be used for hay, cutting should be done when the seed is in the early drouth stage. If the area is large and the force small then cutting must begin somewhat earlier in order to care for all the crop before it has ripened its seed sufficiently to shatter badly. The curing of hay should be in as thick layers as practicable under the climatic conditions, so that there will be as little exposure to the air as possible, and of course the operation of gathering and stacking when cured should be as rapid as possible.

If the forage is to be fed to stock on the farm, storage barns and sheds will quickly pay for themselves. Crops that are to be harvested for their seeds should be cut somewhat before they are dead ripe. If left until fully ripe before harvesting is begun much of the crop may become too ripe before it is completed, resulting in a great loss of grain by shattering when it is being hauled. This is particularly true in dry farming districts for the reason that the atmosphere is usually rather dry, and therefore it quickly removes the moisture from the crop when nearly ripe. It is important to provide granaries for the storage of grain.

Provision should not only be made in this way against the damage that may occur from the weather, but also for the protection against insects and vermin.

Live Stock Fattening.

The method of disposing of crops under dry farming will, like those grown in humid regions, depend upon the conditions, such as nearness to market, the character of the available markets, the climatic conditions relative to stock raising, etc. Near large cities or towns the products of the farm may find ready sale in bulk at good prices or portions of the crops may be used in the production of dairy and poultry products. Far out from ready markets where the haul will be great the farmer must resort to other methods of disposal of the crops not used directly or indirectly in the family food supply.

Usually stock feeding will be found the simplest and probably the most profitable method. Sheep and hogs may safely be placed at the head of the list for feeding purposes under present market conditions, although the fattening of the different classes of cattle and the feeding and fitting of range grown horses for market and sale, may reasonably be expected to share in the disposal of farm products. To sum up the whole question, wherever markets are near and ample the products may be marketed in bulk as grown, but wherever the haul to market is long there must necessarily be made a search for methods of concentrating the farm products into secondary products which, because of their reduced bulk and increased value, may be hauled to market cheaply or like fat stock or fitted horses, can be made to carrp their own weight to market with little loss or expense.

Implements.

There are a number of farm implements which are essential to success in dry farming. The success of dry farm operations may often hinge upon the employment of the right kind of farm machinery. Every farmer who expects to be successful should use the following machinery or others that will prove equally effective: Stirring plow, subsoil plow, sub-surface packer, roller, hoe drill or seeder, disk, surface cultivator, acme harrow, toothed harrow, weeder harvester, and thresher. All of this machinery should be of large draft requiring in most cases from four to eight horses, so that a very wide strip may be treated every time the field is crossed. One man, or often one boy can handle six or eight horses as well as two and thus greatly cheapen the cost of each operation. Every machine should be so equipped that the driver can ride at all times, if he so chooses, and the seat should be so located that he will feel the least inconvenience from the effects of the dust or rough ground. Of course a traction engine may be employed in the place of horses or mules if conditions are favorable. Engines are extremely effective since time is saved and large amounts of work can be performed.

Co-Operative Clubs.

Not infrequently new settlers in dry farming sections will feel unable to purchase the complete outfit of machinery required. However, no excuse is sufficient for doing without implements that can possibly add to the efficiency of the work, cheapen the cost of production, or render the operations more speedy. If the money cannot be borrowed or if it seems undesirable to go in debt for so much machinery, let a half-dozen or more farmers unite, form a co-operative association and together purchase the needed outfit. Rules providing for the alternate use and for the repair of the different machines may readily be formulated. Every farmer will need certain implements. Those can be purchased in greater numbers. Of certain implements, a single machine may often serve for a number of farmers.

Farm Experiments.

Every farmer should do some experimental work. The manufacturer is continually experimenting in order to discover new and better methods. The farmer should also investigate so as to keep abreast of the demands of the times. His experiments should be on a small scale so that, should the results prove disastrous the financial loss would be small. All large problems involving much time or large expense should be turned over to the agriculture experiment station, but there are many smaller problems that require study in each locality. Great care should be taken to undertake the solution of only one thing at a time making all other conditions as nearly identical as possible. Thus erronious conclusions may be avoided.

Important Things to Do.

1. Give attention to detail.

2. Double disk by lapping one-half as soon as the crop is removed.

3. Plow deep, from eight to twelve or more inches before the rainy season sets in.

4. Form a level, fine surface after plowing before leaving the field each half day.

5. Renew the surface mulch as soon after every shower as the soil is dry enough to work without puddling.

6. Cultivate at intervals of from two to four weeks whether it does or does not rain.

7. If the ground was plowed in the fall, cultivate with a light harrow as early in the spring as possible, following this by a deeper cultivation when the soil has dried out somewhat more deeply.

8. Sow or plant rather deeply with a machine that will deposit the seed at an even depth in the moist soil beneath the surface dust mulch leaving a loose surface above.

9. After seeding cultivate at frequent intervals, and as soon after each rainfall as possible, suiting the cultivation in frequency, depth and continuance to the crop and conditions prevailing.

10. Begin harvesting rather early and remove the crop from the field promptly.

11. Use machinery of large capacity.

12. Read and study books, bulletins, magazines and periodicals dealing with dry farming and with agriculture in general.

Don'ts.

1. Don't neglect details.

2. Don't expect heavy crops, but make up for the yields by cultivating extensive areas with machinery of large capacity.

3. Don't expect every year to be a banner year; bad seasons will come.

4. Don't expect to succeed without deep plowing.

5. Don't expect to succeed without frequent cultivation.

5. Don't sow or plant thickly.

7. Don't be too quick to lay the blame upon the soil, or the weather, it may be your fault.

II. ADDRESS ON SOIL CULTURE.

By H. W. Campbell, Bethany, Nebraska. (Abstract of address given at the Denver Congress.)

Twenty-seven years ago, I landed in what is now the north part of South Dakota. I have spent that entire twenty-seven years in tilling the soil and studying its conditions. What we want is demonstration farms. We want them established along the railroad lines, and I hope the time may come, and in the near future, when we may see the establishment in each

Demonstration Farms.

county of our western states, of a demonstration farm where the farmers can come and see, with their own eyes, what to do and what may become of it.

An incident which occurred at Holdedge, Nebraska, involves a great many good points.

A gentleman there had become considerably interested and rented a piece of land across the railroad from what is known as the Burlington farm. In 1903 he summer tilled it. I followed the work very carefully. I was there frequently and aided as best I could. He put his crop in in the fall. Nineteen hundred and four is not the best year we have had.

Acreage yields—Soil Treatment.

This gentleman got 48 bushels of wheat per acre. He was quite enthusiastic. He hoped to carry out the plan thoroughly and followed his harvester with a disk. This is what we urge. We urge it persistently. As soon as he had finished, the thresher came along and threshes his crops. Possibly 10 days after the crop was cut and after this disking was done he commenced his plowing, plowing about eight inches deep, and followed his plow with the sub-surface packer, which he borrowed from our farm. He got about five rods wide around the 40 acres, when for some reason he was called away, and five weeks elapsed before any further work was done. He came back. Now, these five weeks would be the last half of July and major part of August. He came back, took the same plow, plowed the same depth, followed with the packer in the same manner, following the packer with the same harrow, exactly as he had done the previous part of it, and just at the close of this, came a gentle all-day rain, not a dashing rain, but one that percolated down in and moistened the soil very nicely. As soon as the surface was dry, he went on with the harrow and loosened it up. The seed was put in. When he started in with this plowing, I called our foreman's attention to the fact that there was going to be a beautiful demonstration. When that crop was ready to harvest in 1905, myself and two other gentlemen went to the field and looked it over carefully and we unitedly decided that the outside strip would make 50 bushels while the center would make 20. Now, gentlemen, here is a demonstration of many things. It is such things that are puzzling our farmers today.

Now we are getting down to fundamental principles, the real necessary features of that physical condition of the ground, by which we can utilize the elements of air and water in proper quantities together with heat and light.

Soil Treatment.

The question of cultivating the soil is the most complex science we have. What is fertility? Do we know? Does anybody know? I doubt it.

I wish to take up the question of summer fallowing versus summer culture, a subject which I have tried to promote so earnestly.

Acreage Yields.

On our Hill City farm, we summer tilled in 1900. In 1901, 42½ bushels of wheat per acre were harvested on that ground. Remember, 1901 was a hot summer. It was an excessive heat for 100 days and yet our crop went through and made the yield stated above. The next year the land was summer tilled again. The following four years, it has been continuously cropped.

Summer Fallow—Acreage Yields.

Last year, (1906), was hailed out just before the harvest and we connot tell just what the yield was, but they got something like 23½ bushels. It was estimated by five men who went out to look it over that at least half of the heads were down where the harvester could not reach them. Of course some of the rest shelled out. We had, beyond any question, an average of 40 bushels to the acre for four consecutive years after the summer fallowing.

Summer Fallow.

In summer tilling the ground there is a preparation of plant elements, just how this is brought about we do not know, but theoretically, I have sized it up in this way: It is the result of the development of bacteria through the combination of air and water in the soil, under a certain physical condition. If we have too much air and too little water, we will not get the development, and if we have too much water and too little air, the same thing is true.

Conserving Moisture.

If we can secure just the proper quantity of air and water in the soil, keep the water in the soil, and keep the surface loose to admit of the heat, there will be development of plant elements equivalent to two or three crops—it cannot all be utilized in one.

Average Results.

Now here is the point. By getting that proper physical condition of the soil, nature does its work as it is intended, and develops that plant element of fertility to the degree that we are enabled to grow a 60-bushel crop of barley like the crop Prof. Burnett has just stated to us was grown on the North Platte Station farm, while there are other fields on which, with good tillage—the best they could give it—at North Platte, went from nothing to 24 bushels to the acre. At Hill City, upon the

Summer Fallow.

ground, as I told you, that was summer tilled the second time, the fertility was developed to that degree, it grew the crops previously named. We keep this degree of fertility by keeping the ground wet all the time,

Soil Treatment.

and not allowing it to dry out. Here is a vital point: when your crop is harvested, you are not through. You begin immediately to make preparations for the next crop, by following the harvester with the disk, to prevent evaporation and what moisture you may have stored in below, will come up, the soil will be filled with all the moisture it can carry, and that is the ideal condition for handling it.

I do not think there is any question about the assertion we make that we have found the **way**, the **how**, the **time**, the manner of cultivating the soil by which we are sure to get good results. I do not want you to take this assertion as a point for enthusiasm to push forward. I say it can be done, if you would learn **how**, but you have got to learn it. If you half do it, you are liable to fall down. I see that Prof. Hicks, like many of our weather prophets, is pointing to a dry summer. I tremble for the result, for there are so many who do not understand this method of farming. Points have been brought up driviating—one man will say, "Why, if you plow early in the fall you don't need the sub-surface packer,' and another suggests another thing. Gentlemen, look out. Suppose you plow early in the fall and you get another 1903, what will be the result? The same as in 1904,—no crop. That ground must be thoroughly pulverized and it must be just as firm as you can make it with the machine. You need not be afraid of getting it too solid.

Sub-Surface Packer.

The plan of the packer, which was partly displayed to you here, is simply in the form of wedges. They are five and three-eighths inches from centers, seven-eighths of an inch thick at the thickest point. Each wedge goes down into the soil and gives a downward and lateral pressure, crowding the soil together, not pounding it together, and seems to secure the ideal condition, providing your ground is in proper condition when it is plowed.

Soil Treatment.

Now let me go back to the experiment at Holdredge. Why did the center of the field I mentioned give only 20 bushels while the balance gave more than twice as much? For this reason: The weeds growing there during a period when there was very little precipitation had sapped the moisture from the soil to that degree that when the plow went over it, it broke up in little lumps. The air spaces were too large. The proportions of air and water were not in the proper relation, consequently there was not a development of fertility. When the outside of the field was plowed the soil was in ideal condition, when the plow turned it over, it went all to pieces and the packer following up, made a fine, firm seed bed. With that firm condition there is a complete system of roots. The whole strata is permeated with little laterals and veins, while in the coarser soil the root system was very much less effective.

Special Machinery.

In my early work I started out with the idea of drilling the grain 20 inches apart and cultivated it. Something like sixty machines were built the second winter and put up and we produced, with that plan, some very marked results, but the work was too expensive for the average farmer. At that time farmers didn't have very much money, and it was apparent to me that some plan must be formed that would not require this extra machinery which the average farmer could not take hold of. I will now tell you how I got on to this summer tillage idea.

Summer Fallow.

A piece of ground was fitted for winter wheat. It was put in and in the spring, just as it was up nicely and just before heading, a hailstorm laid it flat. I do not know why I did it, but I went on and listed that growed and kept it cultivated through the summer and again put it into crop in the fall. The results were wonderful. In 1900 I started out with the idea of carrying out that plan, thinking then, it might be necessary to, in the more arid sections, summer-till every other year only giving a crop once in two years, after proving that the results from these fields were equivalent to three, four or five ordinary crops.

Conserving Moisture.

We have found that it is not necessary, and think probably, in a rainfall of 15 inches, it will not be necessary to summer-till every year. If you follow out this plan by trying to prevent this evaporation of moisture when the crop is not growing, so as to keep the moisture by summer-tilling every other year until you have gotten in the second summer-tilling, you can then maybe grow two, three, maybe four crops. Much will depend upon the persistency and care of the work and how you take care of the land before and after the crop.

Now with reference to our plan of fitting ground.

Soil Treatment.

We start in, we will suppose, in the spring, with a piece of old ground. We double disk it just as quick as the conditions will let us onto it, that is, after it has thawed out and the water has gone down enough so that it will not stick to the disk. Out object is threefold; to stop evaporation, to admit of the air used in developing the nitrates and bacteria and also, to put that surface in condition to take the next rain when it comes.

Now, a little on that point. Many of you have watered tomato and cabbage plants. When you set them out the surface will be dry. When you put the water on, it seems to lie there. It does not percolate. There is a resistance in those dry particles underneath. After a while it works its way down and then you give a second application of water and it is immediately gone. Now, when you have your soil moist, below the mulch, and when your rain comes and it goes through the coarser soil on top, as soon as it comes in contact with the moist soil below it goes right down just the same as your second application of water, to the bottom of the moist soil where it will force its way, by gravity, on down particle after particle until it is distributed just the same as your first application to the tomato plant. I have watched this over and over again. I

Depth of Moisture.

have gone down into the soil after heavy rains to find that the bottom of the moisture of the soil would be anywhere from one to six or seven inches, according to the rainfall. After a few days, that has gone on down until it is all practically the same. When a heavy rain comes, that dissolves and settles this mulch that you have loosened up on top. You loosen it up with the harrow. If it is too heavy, it becomes too compact to use the disk again. Be sure to keep it loose. Follow this up until about the last of june and then plow it.

Why do we insist upon this up to that date? Because of the weed question. You will find about the last of June the weeds will get very persistent, and it is difficult to keep them down with any tool we can use on the surface.

Then we plow and work late enough so that the second crop of weeds, unless we have a very favorable season as far as rainfall and heat are concerned, will not come on to bother at all. As soon as you are ready to do the plowing, your ground is moist and in perfect condition and it tumbles over and goes all to pieces, and you follow with a packer that makes the bottom firm, and then with the harrow. Then if you get a rain, just an ordinary shower that practically wets the mulch, the common harrow, being larger, answers the purpose just as well. You simply break up the top. If it is just a little sprinkle and does not seem to settle the mulch, don't bother. If you have a long dry spell and no rain, watch the solid soil right under the mulch and whenever you see that the top of it begins to get a little dry, cultivate, because it is time. I have seen several instances where we have cultivated the ground under those conditions, after a long dry spell, and you could go there in the morning and the ground cultivated would be perfectly moist **clear to the top,** while the ground **not gone over** would still be dry. The danger is, in forming a crust underneath, which prevents the circulation of the air and checks all development. Now, this is **vital.**

Thin Seeding.

Keep that surface loose until seed time. If you have summer tilled your ground thoroughly, do not use to exceed 20 pounds of Turked Red wheat, (which I think unquestionably our best yielding winter wheat), in seeding. If you do, you will have it too thick.

Soil Treatment.

Now we are coming to a point where we have done considerable experimenting and we have come to the conclusion that it is not desirable to harrow out grain **in the fall,** unless we have an exceptionally heavy rain after the wheat has begun to stool. Somewhat earlier in the fall, then it is advisable to harrow it, but we do not like to harrow it in the fall, because we have found that where we do harrow in the fall, in the **spring** the ground is liable to get crusted seriously, so that it is almost impossible to loosen it up.

When spring comes, just as soon as the proper condition is reached, that is, when the soil is moist, **not** when it is **dry,** go on with the harrow. Mark you, if you have followed this plan right along you have got a liberal stooling, your stools are thoroughly fixed with roots and you can tip it over sidewise and pretty nearly tear it out and yet your wheat plant will go on and grow. The important feature now, in the spring, is to loosen up that crust, which has formed, in order to admit air. Now, as to the harrowing of the grain in the spring. It may sometimes be necessary to go over it twice, but don't do it unless you have to. The idea is to carry teeth in under cover of the foliage just as I said with reference to the conditions last year with a loose surface. If you can accomplish that, then you are fixed for a crop, barring hailstorms or insects. The circulation of air is absolutely vital. Now let me give you one or two instances, showing why I am so persistent on that air proposition.

Result of Methodical Work.

Down at the Pomeroy farm, in 1901, this excessive year which we speak of, my heart and soul were in the crop of wheat, which was a good one; others failed all around us, and when it came to harvest time we had continued, extreme south winds. We were on the south slope, and it took us ten days to cut wheat we ought to have cut in two days under ordinary conditions.

Soil Treatment.

I suppose from five to seven days prior to that, we had cultivated the orchard with a harrow, and our corn with a twelve-tooth spring cultivator. The corn was then too high to cultivate with the other cultivator. When the grain was all harvested, I instructed the foreman to go into the orchard with the disk and, setting a notch deeper, cultivate; likewise cultivate the corn setting the cultivator one notch deeper than the previous cultivation.

Two days after he began cultivation, I returned and asked him what was his success. "We have worn the points of the harrow all off, and we have broken these teeth in trying to cultivate the corn," he said.

Fruit Trees.

I went into the orchard, pushed the mulch away and tried to break the under dirt with my heel, but could not. I got a hammer and hit it in several places. It was just like cement. Examination with the glass showed that the spaces between the earth particles were literally filled with magnesia alkali salts, that were in the ground, had come up in soluble condition, and as the moisture passed off in a vapor, were deposited there. We then tried double disking in the orchard. On the morning of the fourth day there was a preceptible difference in the color of the leaves of the orchard. The leaves looked as if it was getting drier, but, in examining, we found an abundance of moisture just beneath the mulch. Seven days after this last cultivation, I invited five or six business men out to see the orchard. We were hardly out of town before one man said, "What makes the difference between the north and south half of the orchard?" It was light colored on the north part, while the south part was green and healthy.

We had four months more of that extreme, excessive condition and yet, I never saw healthier trees anywhere than were growing on that piece of land. You, who have my manual, will notice the photographs of the trees are shown giving the growth that particular year. This severe test reveals the value of this cultivation.

We generally speak of going onto new ground. My idea is to break it as early as possible. When I left Dakota, my idea was not to break ground except when the grass was growing, we thought that was the best time. Now I have come to the conclusion—and this is assuming that a man wants to get something for his money—that it is best to break just as early as possible, and I would break in the fall if possible, turning the ground over two and one-half to three inches deep and rolling it flat. If a man has forty acres of ground to break, it will pay him to buy an old fashioned roller to work that flat, then follow it with the harrow so as to loosen up the top and fill the crevices to form a perfectly smooth surface.

(This abstract of the Denver address gives a clear synopsis of the Campbell System by its author.—W. H. O.)

III. DEMONSTRATED FACTS FROM AUTHORITIVE SOURCES FOR NEW SETTLERS ON THE NON-IRRIGATED LANDS OF THE WEST.

1. DEMONSTRATION FARMS AND THEIR VALUE.

In 1903, the Utah experiment station started a demonstration farm of 40 acres near Enterprise, Washington county, Utah. On all sides of the farm, at that time, was an absolute desert for miles around, with no way of getting water on the land save by cloud precipitation.

A more unpromising location could scarcely be found anywhere in Utah. But the quality of the soil was good, and the fundamental principles of **"thorough tillage"** governed the farming operations practiced for the past five years.

Acreage Yields.

The result has been, crops of small grain have **each year** been grown, averaging 25 to 38 bushels per acre.

In this way, every possible doubt as to the success of farming without irrigation in that section of Utah has been removed.

To aid her farmers on non-irrigated lands throughout the state, Utah has appropriated money, and the state experiment station has established five of these demonstration farms in those sections where the greatest good can be accomplished. A conservative estimate, states that our western states have fully two hundred million acres which cannot possibly be irrigated and yet can be made to yield remunerative crop returns through the careful application of the principles of the**"thorough tillage system."**

The establishment of demonstration farms, after the Utah plan, in all our western states, would be of very great advantage to show homesteaders what **can**, and what **cannot**, be grown in their respective regions, **throughout** the **entire west.**

These demonstration farms should be barometers of crop and tillage methods, found in every country or district, where there is located any appreciable area of land, not susceptible of irrigation with an annual precipitation of less han 20 inches.

Our Dry Farming Congress will do well to urge the establishment of these farms under either state or national control. While the offices of Irrigation Investigations and Dry Land Agriculture, of U. S. Department of Agriculture have several stations and while Kansas, Nebraska and Utah as well as Wyoming and Montana hase state stations that are of great value, we need to multiply their number, and so locate them, that they shall save many settlers from financial shipwreck and be a true beacon of successful home practices for every homeseeker in out great and almost boundless West.

2. CONGRESSMAN MONDELL'S EXPERIENCE IN DRY FARMING.

(The following personal experience was related at a fall festival held in Pine Bluffs, Wyo., 1908. Because of its helpful suggestions, your Statistician feels this personal experience of the author of our 320-acre homestead bill, has a place here.)

"My first experience as a dry farmer was obtained as a boy more years ago than I care to tell on a farm in Northwestern Iowa. We did not have a patented name for it at that time. We simply called it a drouth and, as we had not learned how to farm for dry years, we were compelled to live on what we had left over from the year before and our hopes for the year to come. A few years later we had the historic visitation of grasshoppers and that was the driest farming I have ever known. I refer to that experience for the reason that during the five years that the "hoppers" were with us more or less. I learned some things about crops which were quick maturing and the early seeding and the forcing of crops that was of considerable value to my later experience in Wyoming.

"Twenty-one years ago next month I took up my permanent residence in Wyoming, in Weston county, about five miles from where the town of Newcastle now stands. The need of grain and vegetables which could not be secured nearer than fifty miles and then in uncertain quantities suggesed the advisability of growing them, and the absence of water for irrigation compelled the experiment of growing what we needed with the natural rainfall and so I became a Wyoming dry farmer twenty years ago.

My dry farming at that time continued for a number of years, during which time I gradually increased the acreage until I farmed over a thousand acres and raised over twenty thousand bushels of grain and over twenty-five hundred bushels of potatoes, sixteen years ago this season.

Of course we did not call it dry farming, neither had we heard of the "Campbell system" or the biennial system of the Columbia River Uplands, still we did very well on a thin soil and with about fourteen inches of rainfall by simply doing very good farming and at the right time. We would do even better now under the same circumstances, for we have learned many things from those who have been the pioneers and pathfinders in the science of dry farming.

We have now up there in Crook and Weston counties an extensive territory in which farming is carried on and in which reasonably good crops have been grown by the majority of the farmers for the past ten or twelve years, while those who have farmed the best have been rewarded with phenomenal crops most of the time and good crops all the time.

The country up there differs considerably from your country here. It is more hilly and broken and there is a greater variety of soil. Also in the sections most extensively farmed a heavier snowfall. Recently, however, the settlement is extending into a region of open prairie more like yours.

All of our dry farmers are not good dry farmers by any means. In fact some of them are very poor dry farmers, yet they have in the main been quite successful and those who farm the best have been very successful.

During all my service in congress I have been on the irrigation committee and for a number of years was chairman, so I have taken a lively interest in all that pertains to irrigation, but at the same time I have realized that, as not to exceed ten per cent. of the area of the arid states could be irrigated, any considerable development along agricultural lines must depend quite largely upon the possibility of the growing of crops with scant rainfall. Therefore I have studied the possibilities of such development as religiously as I have studied irrigation in all parts of the western states I have visited.

The result of my investigation of the subject has been a surprise at the extent to which the growing of crops with scant rainfall has been carried on throughout the arid and semi-arid region and the limited knowledge that one such region has had of what was being done in all others. In California it has been necessary to discourage rather than encourage dry farming in some regions because irrigation was possible and therefore ought to be practiced.

In eastern Oregon and Washington the system of cropping the ground only once in two years has been practiced on an extensive scale and with great success, while in every state of the west farming is carried on more or less here and there without irrigation and with scant rainfall.

There are some general propositions which have come under my observation that may possibly be useful to you. The first of these is that the successful growing of certain classes of crops on lands which do not contain too great a percentage of clay, with a limited rainfall and without artificial irrigation, has long since ceased to be an experiment. Second, that so-called dry farming under reasonably favorable conditions and by the use of proper methods is but a little less certain and satisfactory in its results than ordinary farming in the average country of heavy rainfall, and much more satisfacory than in many regions of heavy rainfall with poor soil. My personal opinion is based on quite extensive observation that the most satisfactory results will be obtained in most regions having less than eighteen or twenty inches of annual precipitation by biennial cropping and summer tillage. I believe that in the running of the years the farmer will get more dollars per acre per annum from his farm by this method than by annual cropping and with less labor and expense. The only exception I should make to this rule is in cases where a cultivated crop like corn or particularly potatoes or other roots is followed by a grain crop.

No one who has had any experience in dry farming needs to be advised that in every dry farming region adapted to the growth of winter grain such crops are the most certain and satisfactory, neither does any experienced dry farmer need to be told that ground should be plowed in the fall to produce the best results and that it must be plowed deep is so fundamental a proposition that the veriest novice understands it. Above all, in season and out of season, and between seasons, the drying and baking surface must be broken.

The success of dry farming under proper conditions is the hope of the semi-arid west, for it makes possible the settlement of vast areas that otherwise would produce only the scant forage which unaided nature provides. In its development it will double, possibly treble, the cultivated area of the so-called arid states.

Dry farming will prove a helpful ally to add to the live stock industry, for after the last word has been said and the last acre that can be profitably irrigated and can be successfully dry farmed in our western country, has been brought under cultivation, the major portion of our inter-mountain territory will still remain as a permanent grazing region intersperced with the irrigated valleys and the dry farm uplands affording within easy access the feed and forage which relieves the stock industry of the dangerous element of chance and makes possible the improvement of our live stock and its finishing at home, so that we shall become the producers of a finished article rather than a raw material, thereby securing the profits which now goes to others."

3. TEXT OF THE MONDELL BILL WHICH BECAME A LAW JUST PREVIOUS TO THE ASSEMBLING OF THE THIRD ANNUAL DRY FARMING CONGRESS.

"That any person who is a qualified entryman under the homestead laws of the United States may enter, by legal sub-divisions, under the provisions of this act, in the states of Colorado, Montana, Nevada, Oregon, Utah, Washington and Wyoming, and the territories of Arizona and New Mexico, 320 acres, or less, of non-mineral, non-irrigable, unreserved and unappropriated surveyed public lands which do not contain merchantable timber, located in a reasonably compact body, and not over one and one-half miles in extreme length. Provided, that no lands shall be subject to entry under the provisions of this act until such lands shall have been designated by the secretary of the interior as not being in his opinion susceptible of irrigation at a reasonable cost from any known source of water supply.

"Section 2. That any person applying to enter land under the provisions of this act shall make and subscribe, before the proper officials an affidavit, as required by Section 2290 of the Revised Statutes, and in addition thereto shall make affidavit that the land sought to be entered is of the character described in Section 1 of this Act and shall pay the fees now required to be paid under the homestead laws.

Section 3. That any homestead entryman of lands of the character herein described, upon which final proof has not been made, shall have the right to enter public lands, subject to the provisions of this act contiguous to his former entry which shall not exceed 320 acres, and residence and cultivation of the original entry shall be deemed as residence upon and cultivation of the additional entry.

"Section 4. That at the time of making final proof, as provided in Section 2259 of the Revised Statutes, the entryman under this act shall, in addition to the proofs and affidavits required under the said section, prove by two creditable witnesses that at least one-eighth of the area embraced in his entry was continuously cultivated to agricultural crops other than prairie grasses beginning with the second year of the entry, and that at least one-fourth of the area embraced in the entry was so continuously cultivated beginning with the third year of the entry.

"Section 5. That nothing herein contained shall be held to affect the right of a qualified entryman to make homestead entry in the states named in Section 2259 of the Revised Statutes, but no person who has made entry under this act shall be entitled to make homestead entry under the provisions of said section, and no entry under this act shall be commuted.

"Section 6. That whenever the secretary of the interior shall find that any tracts of land, in the state of Utah, subject to entry under this act, do not have upon them such a sufficient supply of water suitable for domestic purposes as would make continuous residence upon the lands possible, he may, in his discretion, designate such tracts of land, not to exceed in the aggregate 2,000,000 acres, and thereafter they shall be subject to entry under this act without the necessity of residence. Provided, that in such event the entryman on any such entry shall cultivate in good faith not less than one-eighth of the entire area of the entry during the second year, one-fourth during the third year, and one-half during the fourth and fifth years after the date of such entry, and that after entry and until final proof the entryman shall reside within such distance of said land as will enable him successfully to farm the same as required by this section."

4. SUGGESTIONS TO ORCHARDISTS.

By E. E. Stephens, Crete, Nebraska.

(Below we give an abstract of a paper full of helpful suggestions, by an experienced nurseryman, who has been very successful with orchards in certain sections of our non-irrigated west.)

Trees ignorantly or carelessly handled discourage the planter, who on his part not only loses the money and labor he puts into the effort, but his failure is discouraging to his friends and neighbors and, to that extent, impairs the development of the country.

Causes of Failure.

It has been our observation that the farmer is oft-times more careful about planting his trees than about the cultivation of them after them are planted.

He rouses himself to a special effort at planting time and having planted with the same care that his father exercised in some eastern state, he feels that he has done his whole duty, and gets busy with his crops and other duties and forgets that trees and plants, handled under semi-arid conditions, need a great deal more care and attention than trees planted in the eastern and middle states. No farmer would expect to raise a crop of corn, if he simply carefully planted and then neglected it.

Tree Planting.

While the commercial orchardists in our districts prepare a northeasterly slope, the family orchard should be near the house, without reference to slope; in other words, do not put a family orchard on a remote corner of the farm, simply to take advantage of a northeasterly slope. The writer has orchards planted on all slopes as well as uplands and bottomlands, and usually orchards do well in all locations.

The location as to slope, is not as important as the care the orchard receives after planting. We thoroughly believe in wind breaks to the south, west and north of the orchard. The wind break on the south and west, lessens the aridity of dry winds in summer, and a row of lofty growing trees on the east, prevents the rays of the sun from raising the temperature too quickly after a frosty night.

Soil Preparation.

Since the average farmer has more than he can possibly handle, he should utilize his team as far as possible in preparing ground for planting.

After having thoroughly plowed the ground, and done all that can be done by plowing, pulverizing and harrowing, part of the hand labor of digging holes can be saved by cross-marking and then running the lister to the utmost depth possible to attain, then planting trees at the intersection of the cross-marking. In semi-arid regions, it is well to plant fruit tree six to eight inches deeper than they stood in the nursery row. Our habit is to plant without the use of water, until the earth has been filled in three inches over the roots and thoroughly tramped. Leave a basin surrounding the tree. If the soil is not sufficiently moist, add two pails of water to the tree. After this water has soaked away, cover this wet surface with three or four inches of earth, leaving the surface loose. Never tamp the wet soil. Plow and cultivate the ground in such manner that the slope of the ground is toward the tree, then heavy dashing showers throw an increased percentage of water to the tree. After cultivation, ultimately and gradually allow the ground to become level.

Soil Mulch.

Cultivation gives the best mulch of all. If you can give perfect cultivation, you have the best possible mulch. If circumstances are such that you cannot, or will not, do this, then mulch with stable litter or any material that will retain moisture.

Treatment of Trees.

Bundles should be properly opened and the roots soaked in water. While waiting to plant, it is well to buy the trees and plant in the ground. temporarily, in such a manner that the moist mellow dirt will come in contact with all the roots and trunks and thoroughly protect them from the air.

If, by reason of delay, the trees should be shriveled when received, they can be brought out in safety by burrying them entirely in moist earth, root, body and branch for two or three days.

Tree planting.

It sometimes happens that the weather, after planting, is very unfavorable, the evaporation may be very rapid. The trees that have just been planted can take up but very little moisture from the ground, no matter how much water you apply, until they have made granulations for new root growth. Under such conditions, the trees or plants may be rapidly exhausted before granulations have been formed and the fresh supply of sap taken up. Perhaps the tree does not leaf out, or perhaps it comes out with small, delicate leaves, and then the hot, dry winds damage the trees. Under such conditions, the trees can be saved by boxing in the trunk with six by six fencing. Fill this upright box three times a week. This will usually cause the trees to leaf out within ten days and to grow the season through. This method has been thoroughly tested and is of the utmost importance.

It is very much cheaper to put in a little work, and save your trees, than to lose a year's time as well as the trees. Leave these boxes around the trees during the winter. In trying climates, boxing in trees, is of great value in guarding against winter sun scald, so destructive to trees in the west and northwest.

Trimming Trees.

Apparently the well meaning planter dislikes to trim his trees when he receives them. He seems to feel that he is mutilating a thing of life. Perhaps he feels that it affects the looks of the trees, and so it does, temporarily, but at the end of the season, the trees which are balanced up, shortened as the previous season's growth and which are properly balanced as to top and root system, will be found to have made twice the growth of trees not trimmed. Over and over again, we have planted thousands of trees, cut off the same blocks and same lots as those shipped to our customers and have found, in our experience, that a judicious shortening of the top, to strike a balance between top growth and root system, was immensely helpful; first, in its lessening loss of sap by evaporation; second, by enabling it to endure the shock of the transplanting; to more quickly establish proper conditions of growth, and finally, in the course of the season, to make a far stronger growth than the trees not shortened.

It is quite important that each kind of tree be trimmed in accord with its peculiar qualities. With apple trees, our habit is to shorten back three-quarters of the growth of the side branches, leaving a dominant center so that the next set of branches will be 12 to 18 inches above the lower set of branches.

Shortening back should rarely be construed to mean to remove any of the branches. Rather, shorten **all the branches** and leave all that were on the tree when received from the nursery man.

Cherries.

Cherry trees have fewer buds on the branches than apple trees, hence the side branches of the cherry should be trimmed with reference to the number of strong, vigorous buds to each branch remaining. Sometimes buds are injured by transportation or by packing into cases. Three or four buds should be left on each branch of the cherry tree, which will leave the branch from one-half to a little more than one-half its original length. Count the buds to determine to what point to shorten the branch.

Peaches.

The peach tree belongs to still a different type of trees and should be handles in a different manner. Most growers now prefer to head their trees rather low. The peach tree almost invariably reaches the planter in the condition of one year from the bud, or in the case of a June bud, only a few months from the bud. Usually there are a good many buds up and down the trunk of the peach trees, and trees that are five to six feet or 4 to 5 feet in height may usually be cut back to perhaps 30 inches, and then the buds at the base of each branch usually start and make a vigorous growth in the course of the season.

Plum Trees.

Plum trees are trimmed very much in accord with the suggestions given for apple trees.

Trimming Bush Fruits.

Small fruits like currants and gooseberries should be severely shortened in, and depend for the season's growth on the lower buds. The lessening of the evaporation materially assists in enabling the plant to surely establish itself and to make a satisfactory growth in the course of the summer. This is peculiarly true in the handling of ornamentals, roses and shrubs. They should be cut back in proportion to the plant and root system. Roses, in the condition ordinarily received, should be cut back to within six inches of the ground and then depend on starting some vigorous shoots from near the surface of the ground. Frequently in trying to supply all the branches to the tip with the sap, the root system, which has been lessened by the shock of digging, is unable to furnish a sufficient amount of sap to any of the branches. Under such conditions the plant is stunted and handicapped from the outset. In contrast with this, trees properly trimmed at planting time, frequently make a growth of 24 to 40 inches the same season set. Over and over again in our orchards, we have had trees put on a growth of 30 to 50 inches the first season, this of course when the trees were properly planted and thoroughly cultivated, giving them every opportunity to do their best.

These suggestions are supremely important, also, in the planting of shade trees.

Trunk Protection.

To lessen the evaporation from the trunk of the tree, damage from heat of the sun and also the effect of the aridity of the wind, we have for some years adopted the methods of protecting the trunks of trees with wooden veneers, corn stalks, cloth, heavy paper, (never **black** paper), or anything that would lessen the effect of the sun on the trunk. It should be remembered that trees are grown close in the nursery row; that in the nursery they are protected by each other. When transplanted into the open ground, the bark oft-times suffers severely, the same as your arm would sunburn of you should roll up your sleeves in midsummer.

Controlling the Form of the Tree.

The planter should observe that not all buds of a branch are on the outside, nor are they all on the inside, near the center, but are distributed the whole circumference of the twig. This is of importance to the planter. Why? Because it enables him, at will, to control the future shape of the tree. If the tree is so formed as to carry an open head, the sunlight is admitted to the center of the tree, the fruit colors better and it is more attractive. Therefore, in shortening branches, it is wise to trim trees that normally have an erect habit in such manner that the last bud is an outside bud.

Usually the flow of sap forces the most vigorous growth to the last bud left on the branch. Now if the last bud is an outer bud, the effect is to give the head of the tree a spreading form. In case the form of the tree is such that the branches are unevenly distributed about the trunk, should the last bud be a side bud, then the tendency of the growth is to close the opening and give more symmetrical form. In trimming trees that have a very spreading, sprawling form, then the reverse would be the proper method, leaving an inner bud, which would assist in correcting a sprawling form of growth. It is wise in pruning a tree to train it to a growth that shall protect the trunk from sun scald, that is, that the trunk may be properly protected from south and southwesterly winds.

Orchard Cultivation.

In the first two years, lies much of the secret of success with trees and plants. We find that most people plant trees, but we regret that very many neglect them afterwards.

Nursery Stock.

In the growing of nursery stock, particularly apple and forest seedlings, where we have been desirous of getting the utmost possible growth in one season, we have found that, in the middle of summer, it was advantageous to cultivate as frequently as once in four days, that the trees that were cultivated six or seven times a month gave, as a result, at the end of the season, a larger percentage of No. 1 plants than blocks of stock less frequently cultivated. We would suggest that with most planters, orchard cultivation, once a week will be sufficient, or oftener, if there should come a shower of rain between, to crust the surface.

During that portion when the rain does not fall and a crusted surface is not developed, three times a month will oft-times secure fair results.

It is our belief, based on 35 years' experience, that the areation of soil, that goes with frequent cultivation, helps to develop an increased amount of plant food. This, when coupled with an abundant amount of moisture, gives ideal conditions for the proper development of the tree, or plant, and the most rapid growth attainable by any method.

Our own orchards have been cultivated 10 to 20 times yearly and where orchards were overladen with fruit and season was very dry, we have sometimes cultivated the surface as often as once each way weekly.

Depth of Moisture.

"In the extremely dry season of 1894, we secured a crop of 400 bushels of apples per acre in one of our orchards, maintaining a suitable degree of moisture by frequent cultivation. Although that season was entirely dry, the last days of August, we found, on examination, a good degree of moisture up to within two inches of the surface.

"At Benton Harbor, Michigan, during a certain season, there was not enough precipitation to wet the ground to a depth to exceed an inch, from the 20th day of May till the 14th day of September.

Results of Methodical Work.

Mr. Roland Morrill cultivated his 80 acre peach orchard 40 times in 40 consecutive working days using Breed's weeders. Four teams cultivated 80 acres of the orchard once each day, six days in a week for 40 days, the results were most happy and entirely satisfactory to Mr. Morrill. His neighbor's orchards suffered seriously from the unnatural drouth. His own orchard went through in such form that his trees retained their full measure of vitality, and the next year gave him a crop that sold for 35,000 dollars. His peach trees averaged eight bushels per tree.

When to Cease Orchard Cultivation.

"The object of this intensive cultivation is to carry an orchard as the railroad runs an express train, at full speed; and then, by the application of the brakes, the momentum of the train is stopped at a proper point at the station; so the orchard is pushed to a vigorous growth until the first of August, then as a rule cultivation should cease.

"Sometimes the conditions as to weed growth or moisture are such that it is advisable to continue cultivation until the middle of August; other seasons it is wise to check cultivation by the middle of July and allow the development of light weed growth, which shall assist in checking the rapid or unripe growth and cause the tree to ripen in season to be ready for the first Autumnal freeze. In a general way trees should be cultivated later the first season after planting than after they have attained such a vigorous root system, as to create liability to too late growth and unripe wood.

"Under arid or semi-arid conditions, it is not wise to seed down the orchard at any time. We are still cultivating our 35 year old orchard from eight to 12 times each season.

Tree Protection.

"Do not fail to guard young trees against rabbits. The protection given to guard against the sun scald will perform a dual purpose of guarding against rabbits or in case that this has not been done, as in case of forest trees, where the number of trees are so large it is not convenient to tie up each tree, then it is well to remember that rabbits have a sensitive nose and can be kept away by applying, with a swab, a combination of blood, soap and tobacco; sometimes we have added red pepper or crude carbolic acid or any offensive substance. The use of a slight amount of flour in the combination makes it more adhesive and less liable to wash off.

Winter Mulching.

"Currents, gooseberries, raspberries and blackberries should be heavily mulched before winter sets in. Stable litter is usually the most convenient for currants and gooseberries. We use straw in the raspberry and the blackberry plantations. In the case of these plants, we allow the straw to remain on the rows the entire season. It checks the growth of weeds, and retains the major portion of the moisture for the benefit of the plantation.

"Since the adoption of this method we have never failed to secure a crop of fruit. Fortunately the raspberry and blackberry plants bloom so very late in the season, that they are rarely or never injured by the late spring freeze.

"About the time the ground commences to freeze, the strawberry bed should be covered by old hay, stable litter may be used, if free from weed seed.

Vineyards.

"We have found it wise to trim our vineyards each fall. Drop the canes to the ground, cover with straw and put over them enough to hold the straw down tightly. We regard this as very, very important.

"The vines left up will often dry out and sometimes suffer severely during the winter from the extreme cold. The cost is slight. We cover our grapes with straw and dirt at a cost of not more than two cents per vine, and the increased certainty of the return makes this a paying investment.

IV. FIRST DRY FARMING EXPOSITION.

The Third Dry Farming Congress was quite successful in interesting farmers to bring in crop exhibits and implement dealers to exhibit modern implements adapted for use on non-irrigated farms in the West.

Prof. H. M. Bainer, Professor of Farm Mechanics, Colorado Agricultural College, and well known to all agricultural implement dealers of

America, was superintendent of the Farm Machinery Exhibit, and secured such co-operation of farm implement concerns, that the machinery exhibit filled two large rooms. It was a live feature of the Congress, fully appreciated by all the visiting farmers.

"The Farm Crop Exhibit was held in a hall, 60x66 feet, and completely filled it with crop exhibits from Canada, South Dakota, Montana, Utah, Idaho, Wyoming, Nebraska, Kansas and Colorado.

The Board of Control put up the cash awards and interested implement firms. The Chambers of Commerce of Denver, Salt Lake and Billings, together with business firms of Cheyenne, offered special premiums, making a most interesting list of implement and trophy prizes.

The State of Wyoming offered a handsomely engraved cup for the best State Exhibit, and the Denver Post, a sterling silver cup, for the best individual exhibit of non-irrigated products grown in 1908

Dr. V. T. Cooke was the Superintendent of the Exhibit, assisted by your Statistician.

Below is a list of awards. Where donor is not named, the premium was given by The Cheyenne Board of Control:

"Following is the complete list of the prizes awarded at the Dry Farming Exposition at Keefe hall. All of the prize winning showings were grown absolutely without irrigation:

Grain Classes.

"Class 1—Best 10 ears flint corn. First, George Meinig, Parker, Colorado; second, A. M. Axelson, Haxtum, Colorado; third Carl Nelson, Haxtum, Colorado.

"Class 2—Best 10 ears Dent corn. First, J. K. McClelland, Hays, Kansas; second, Fred D. Johnson, Wray, Colorado; third, Carl Axelson, Haxtum, Colorado.

"Class 3—Best 25 pounds hulless barley. First Keen Bros., Pueblo, Colorado; second, E. Blain ,Cambria, Wyoming; third, M. L. Sudduth, Broadview, Montana.

"Class 4—Best 25 pounds hulled barley. First, William Starr, Mona, Utah; second, Charles Green, LeRoy, Colorado; third Wilhelm Martin, Chadron, Nebraska.

'Class 5—Best 25 pounds oats. First, E. Blain, Cambria, Wyoming; second, Keen Bros., Pueblo, Colorado; third W. X. Sudduth Broadview, Montana.

"Class 6—Best 25 pounds Emmer. First, George Freemyer, Haxtum, Colorado; second, Keen Bros.; third, W. X. Sudduth.

"Class 7—Best 25 pounds fall wheat. First, W. H. Fairchild, Lethbridge, Alberta, Canada; second, Dr. V. T. Cooke, Cheyenne; third, E. Blain.

"Class 8—Best 25 pounds spring wheat. First, Keen Bros.; second, J. MacGregor, Idaho Falls, Idaho; third, Charles Green.

"Class 9—Best 25 pounds Durum wheat. First, Dr. V. T. Cooke; second, Keen Bros.; third, W. X. Sudduth.

"Class 10—Best 25 pounds spring rye. First, Keen Bros.

"Class 11—Best 25 pounds fall rye. First, H. B. Card, Manville, Wyoming; second, Dr. V .T. Cooke; third, Keen Bros.

"Class 12—Best 25 pounds field peas. First Col. E. J. Bell, Laramie, Wyoming; second, W. X. Sudduth; third, Keen Bros.

"Class 13—Best 25 pounds alfalfa seed. First, F. W. Coates, Newcastle, Wyoming; second, M. L. Sudduth; third, Wilhelm Martin.

"Class 14—Best 25 pounds field beans. First W. X. Sudduth second, P. J. Scott, Campstool, Wyoming; third, John Baer, Rushville, Nebraska.

„Class 14A—Best 25 pounds flax. First W. X. Sudduth; second, Miss Mabel L. Sudduth.

Forage Classes.

"Class 15—Best growth alfalfa. First, Keen Bros.; second, Mabel L. Sudduth; third, A. M. Nelson, Newcastle, Wyoming.

"Class 17—Best growth pea forage. First, John Weigher, Cambria, Wyoming.

"Class 18—Best growth sorghum. First, George Meinig; Second, C. S. Graves, Arriba, Colorado.

"Class 20—Best growth Milo maize. First, C. S. Graves.

"Class 21—Best sheaf millet. First, A. M. Axelson; second, Keen Bros.; third, Charles A. Matthews, Elbert, Colorado.

"Class 22—Best sheaf flax. First, Miss M. L. Sudduth; second, Dr. W. X. Sudduth; third, A. M. Axelson.

"Class 23—Best sheaf, other forage. First, W. S. Pinkerton, Manville, Wyoming; second, Keen Bros.; Third, A. M. Axelson.

Class 30—Best 30 pounds potatoes. First, Charles Green, LeRoy, Colorado; second, C. S. Graves; third, Mrs. F. C. Davis, Arcola, Wyoming.

General Display Classes.

Class 31—Best display corn, open to the world. First, Fred Johnson, Wray, Colorado, No. 6 plow, John Deere Plow Co.; second, Haxtum Corn Club, Haxtum, Colorado, ribbon; third A. E. Edwards, Haxtum, Colorado, ribbon.

"Class 32—Best display wheat, open to the world. First, Keen Bros., Monitor seed drill, Nebraska Moline Plow Co., Omaha; second, Dr. W. X. Sudduth; third, Dr. V. T. Cooke.

Class 33—Best display potatoes, open to world. First, Chamber of Commerce, Billings, Montana, pair garden disc cultivators, Nora Springs Manufacturing company; second, Charles Green, LeRoy, Colorado; third, C. A. Sherman, Manville, Wyoming.

"Class 34—Best collection native grasses and cultivated feed crops. First, C. I. Gardner, Billings, Montana, Eclipse windmill and steel tower, Fairbanks, Morse & Co., Denver Colorado; second Keen Bros.

"Class 35—Best collection of grain, forage and root crops. First, Chamber of Commerce, Billings, Montana. Choice of agricultural implements between first and second exhibitors; second, Keen Bros.

Specials.

"Class 36—Best 25 pounds peas, Wyoming grown. First, Col. E. J. Bell, Wyoming Tribune cup; second, Patrick Scott, Campstool.

"Class 37—Best 25 pounds oats, Wyoming grown. First, E. Blain, Cambria, Wyoming Cheyenne Leader cup.

"Class 38—Best individual exhibits from Colorado. First, Keen Bros., Denver Chamber of Commerce cup; second, A. M. Axelson, Denver Chamber of Commerce cup; third, Charles Green, Denver Chamber of Commerce cup.

"Class 39—Best individual exhibit open to the world. First, Keen Bros., Denver Post trophy cup.

Class 40—Best fruit display. First, E. R. Parsons, Parker, Colorado, tank heater, McDonald & Morrison Manufacturing company, Dubuque, Iowa; second, David Broadhead, Nephi Utah, pair stock fountains.

"Class 41—Best state exhibit of non-irrigated farm products, open to the world, Colorado. Trophy cup given by the state of Wyoming.

"Class 42—Best individual exhibit from Wyoming. Dr. V. T. Cooke, Citizen's National Bank, Cheyenne, Wyoming trophy cup.

"Class 43—Best display alfalfa, open to the world. First, Keen Bros., choice of agricultural implements between first and second; second, Miss Mabel L. Sudduth, Broadview, Montana.

"Class 44—Best bushel potatoes, Wyoming grown. Mrs. F. C. Davis, Arcola, Wyoming, 24piece silver set given by Dan S. Park Jewelry Co., Cheyenne.

"Class 45—Best display agricultural products grown in Laramie county, Wyoming, W. C. Brisbane, Divide, Wyoming, Planet Junior cultivator, given by F. A. Roedel Hardware Co., Cheyenne, and $5 pair shoes, given by Jenkins Shoe company, Cheyenne.

"Class 47—Best 25 pounds wheat, Wyoming grown, Dr. V. T. Cooke, hand painted china vase, Buechner Jewelry Co., Cheyenne.

"Class 48—Best 25 pounds Turkey Red wheat, open to the world. W. B. George, Billings, Montana, Billings Chamber of Commerce cup.

"Class 49—Best 25 pounds barley, open to the world. H. Price, Carpenter, Wyoming, silver loving cup, Chamber of Commerce, Salt Lake.

"Class 50—Best agricultural exhibit by woman homesteader, open to the world. Miss Mabel L. Sudduth, Broadview, Montana, $25 worth of seeds from Barteldes Seed Co., Denver."

One premium, not named in above list, was a set of stock fountains, two (2), awarded to Fred D. Johnson, Wray, Colorado, for best display of corn, given by Novelty Manufacturing Co., of Sterling, Illinois. Judge of awards was Prof. B. C. Buffum Worland, Wyoming.

Another feature of the Exhibit, exceedingly attractive, was the photograph display, exhibited in a special room, adjoining the crop exhibit.

Pictures of farm scenes on non-irrigated farms from all over the West, were mounted on compo boards and formed a frieze, two feet wide, entirely around the room, a running panorama of Dry Farming scenes 100 feet long. Your statistician strongly urges the continuation of the Congress Exhibit—**Crop, Machinery and Photo**—at future sessions.

It is an educational feature which **corrects errors**, molds public opinion, and stimulates activity in a way that is helpful and influential to all interests associated in the dry farming movement.

5. CONCLUSIONS TO BE DRAWN.

Elsewhere, is given the full proceedings of the Congress. Here, your Statistician would give a short review or epitome of what was accomplished at the Cheyenne meeting.

He wishes to call special attention to the "Seven Essentials" given below:

The Third Dry Farming Congress demonsrated beyond the question of a doubt that some farmers on the non-irrigated lands of the West, with less than twenty inches of rainfall "made good" in 1908, our hardest crop year for more than a decade. The farmers explained their method of growing crops and had an exhibit of 1908 crops which was an unanswerable argument of the truth of their assertions. Theorists might theorize and tell how it should be done, but these farmers "delivered the goods" and told the hundreds of visitors just how they succeeded, a most helpful feature for every new settler of the West. This experience meeting was a most helpful feature of the sessions of the Congress. They told us that farming in the West calls for the highest class of intelligence and that we need to discourage the settlers who cannot "mix brains with the sod."

From the most excellent addresses given and discussions heard, your statistician gleaned the following as fundamentals which every new settler should realize as essential and all important:

First—Choose a soil adapted to farming, with a clay subsoil. Shun a sandy subsoil, since it tends to leach moisture and makes it difficult to maintain a soil reservoir, where, by capillary action, moisture reaches the plant as it has need. A sandy surface soil needs different treatment than a clayey, or clay loam surface soil. Hence, do not treat all soils alike.

Second—Have one cash money crop, but make the major portion of the farm seed crop, which will give back to the soil at least 75 per cent soil value of the crop fed, to keep up the fertility of the farm and maintain humus.

Third—Therefore, keep livestock on the farm, the kind of livestock to be determined by the farm environments, market conditions and farm capital the owner can invest..

Fourth—Adoption of moisture conserving methods of tillage is vital and all important. Deep plowing, in the average soil, is a requisite of prime importance.

Fifth—Use acclimated seed of the most drouth resistant type which can be made to fit into a pusposeful, practical rotation for the farm. At least one legume should be grown in all rotations chosen.

Sixth—Some capital is absolutely essential for all settlers in Western lands.

In every instance of failure which the writer has been able to trace in the last four years, he finds in the start a dearth of capital. We must frankly, candidly and fairly state that some capital here, as elsewhere, is required to build a home. The writer would hesitate to urge a man to bring his family to open up a homestead who did not have enough to "stake him" for at least twenty-four months. Instances were given at this Congress where men have worked for others and made good with little or no capital, but it is running too great a risk to encourage any man to trust to luck to pull his family through. Some capital, then, be it asserted, is necessary to found a home.

Seventh—Back of soil, climate, seed system and capital must be a resourceful, determined, intelligent farmer, one willing to learn from his neighbors and to adapt himself and his methods to his environment.

Such a man is the one who will, through utilizing flood waters, or a well, supplement the main farm with a vegetable and fruit garden which he can irrigate when rains do not come at the proper time for best results. Such a man will give his family an attractive home with modern conveniences throughout. He will also make the dairy cow, hog and hen bring in a regular income, incidentally manufacturing cheap home grown feeds into products which the market constantly demands.

Good business management often measures the difference between success and failure on the farm.

It has been the men who put in practice the three cardinals of the Congress—Education, Conservation, Culture—who are blazing the road for the rest of us to follow.

We received at this Congress the unqualified statement of farmers with more than a quarter of a century's experience, that they had actually "made good" all these years. When we realize that these men represent the varying conditions to be found in traveling from western Texas to eastern Washington, we were made to realize that "dry farming," so-called, in the United States has passed from an experimental stage to an accomplished fact and is now on a commercial basis.

Dr. Macdonald from the Transvaal, South Africa ,and Senator McColl from Australia, told us that dry farming operations have been carried on in these countries for several decades. We also were reminded at this Congress that the Pueblo and Aztec natives of the southwest practiced dry farming for centuries in the crudest way and grew crops.

A sane, safe, conservative, well-organized movement was arranged for at this Congress which will make it a positive, permanent, most helpful factor to every farmer in the West on our non-irrigated lands who will subscribe to its membership. It seeks to encourage the farmer to study the Why, How and When of all farm operations and to let up only when he wrests success from the struggle and the problem of successful cropping of his land is solved.

Respectfully submitted, W. H. OLIN, Statistician.

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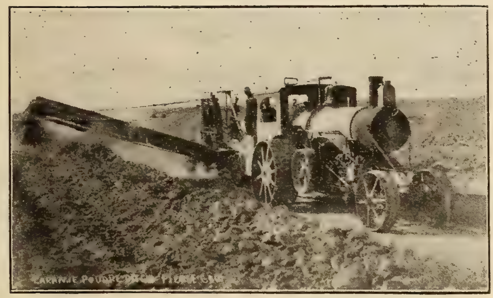

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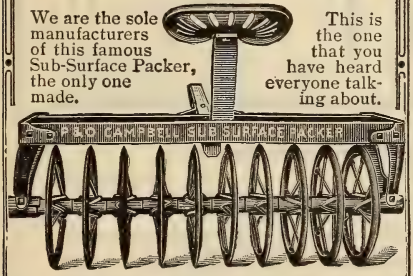
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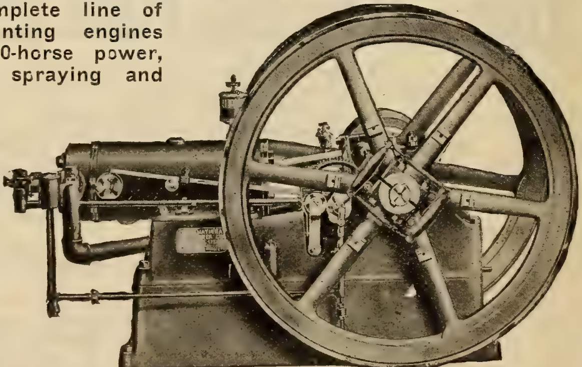

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Salt Lake City, Utah, July 8, 1908.

Dear Sir:

We are sending you herewith a copy of the official proceedings of the second session of the Trans-Missouri Dry Farming Congress. This pamphlet is sent you as a member of the Congress and it is hoped that you will find it useful in your work. It has been most carefully edited and contains much practical and scientific information that cannot fail to be of value to those who are interested in the subject to which it relates.

There is no economic question now before the people of the United States of more profound importance than that of Dry Farming. The success of the idea means an almost inconceivable increase in the cultivatable area of the country and an ultimate [illegible] Since the meeting of the second session in January, 1908, the increase in membership has been most gratifying and evidences of interest in the propaganda of scientific soil culture continue to come to this office from all parts of the world.

The next session of the Congress will be held at Cheyenne, Wyoming, in January, 1909; but in the meantime it behooves us to actively interest ourselves in the work of increasing the membership and thus extending and strengthening the influence of the organization along the proper lines. This must be done if we expect State or Government aid by the establishment of more State and National Experiment Stations.

The Officers and the Executive Committee of the Congress count on your individual help for the speedy accomplishment of these purposes, and with that thought in mind we enclose several blank applications for membership with the earnest request that you use your best efforts to obtain more members, thus benefitting your neighbors and aiding in the great work before the Congress. We are

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